

# GLEN CANYON HIGH FLOW EXPERIMENT NOVEMBER 2013

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Southern Nevada Water Authority

# Glen Canyon HFE

- ▣ Sediment carried by the Colorado River creates sandbars for habitat and beaches for camping and recreation.
- ▣ Glen Canyon Dam traps 90 percent of the sediment that previously moved through the Grand Canyon.
- ▣ The Glen Canyon Dam final EIS (March 1995) hypothesized that controlled high-volume releases could help redeposit some of this sediment downstream.
- ▣ A total of 5 releases have been conducted to test this hypothesis. March 1996, November 2004, March 2008, November 2012, and November 2013.

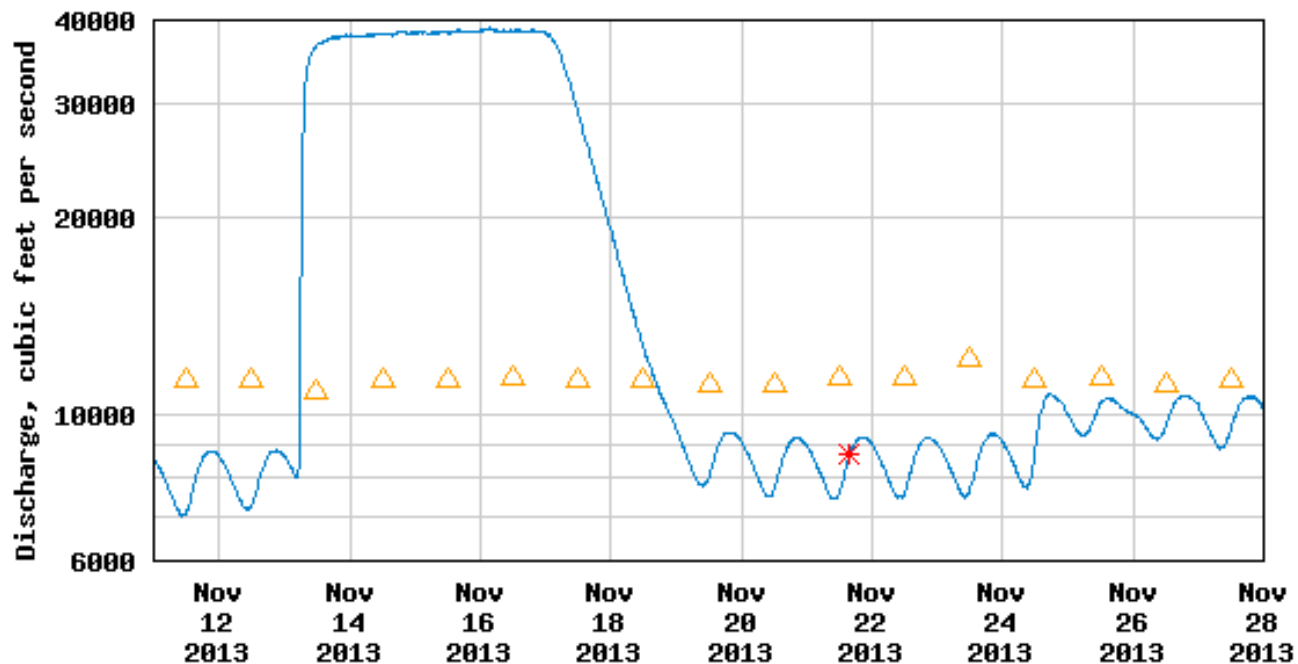
# Glen Canyon HFE, 2013

- ▣ Approximately 4 days of sustained flow above 38,000 cfs.
- ▣ Peak of 39,000 cfs arrived at USGS gage above Diamond Creek on November 16<sup>th</sup> @ 03:30.
- ▣ High flow first arrived at Lake Mead the night of November 13<sup>th</sup>.
- ▣ Lake Mead sampling began on November 14<sup>th</sup>.

# Peak of 39,000 cfs on November 16<sup>th</sup> @ 03:30



USGS 09404200 COLORADO RVR ABV DIAMOND CREEK NR PEACH SPRINGS AZ



----- Provisional Data Subject to Revision -----

△ Median daily statistic (25 years) \* Measured discharge  
— Discharge

# Glen Canyon HFE, 2013

- ▣ Samples were collected on November 14<sup>th</sup>, 15<sup>th</sup>, 16<sup>th</sup>, 18<sup>th</sup>, 20<sup>th</sup>, and 26<sup>th</sup>.
- ▣ Four primary sites were CRLMA, CR394.0, CR390.0, and CR380.0.
- ▣ Total Nitrogen and Total Phosphorus samples were collected at depth of highest turbidity on November 14<sup>th</sup>, 15<sup>th</sup>, and 16<sup>th</sup>.
- ▣ Additional profiles collected at CR372.0, VR2.0, and CR346.7 (dependent on weather conditions and data from upper sites).

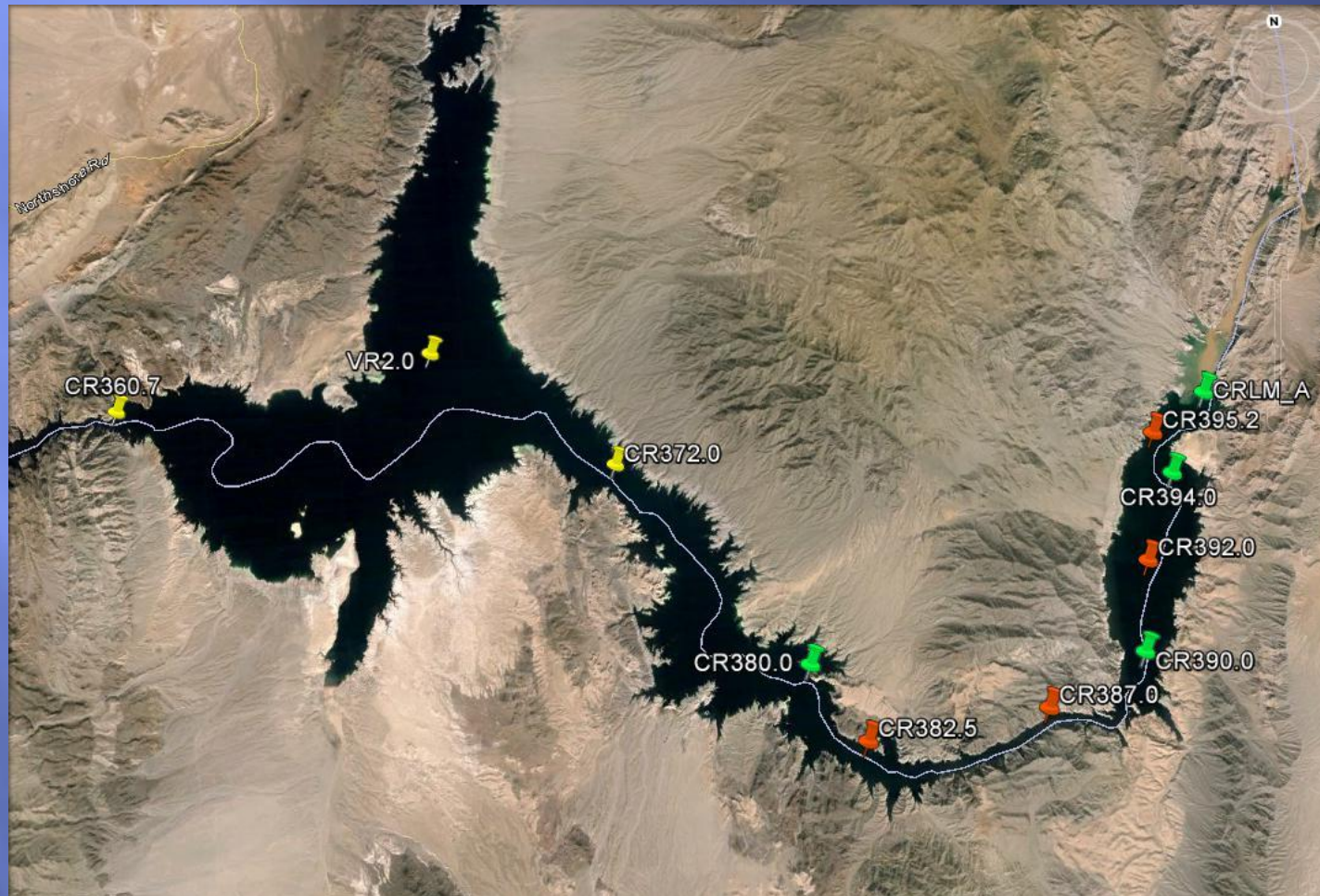
# Glen Canyon HFE, 2013

- ▣ An additional 4 sites were profiled for Temperature and Conductivity only using Castaway© CTD (Conductance Temperature Depth).

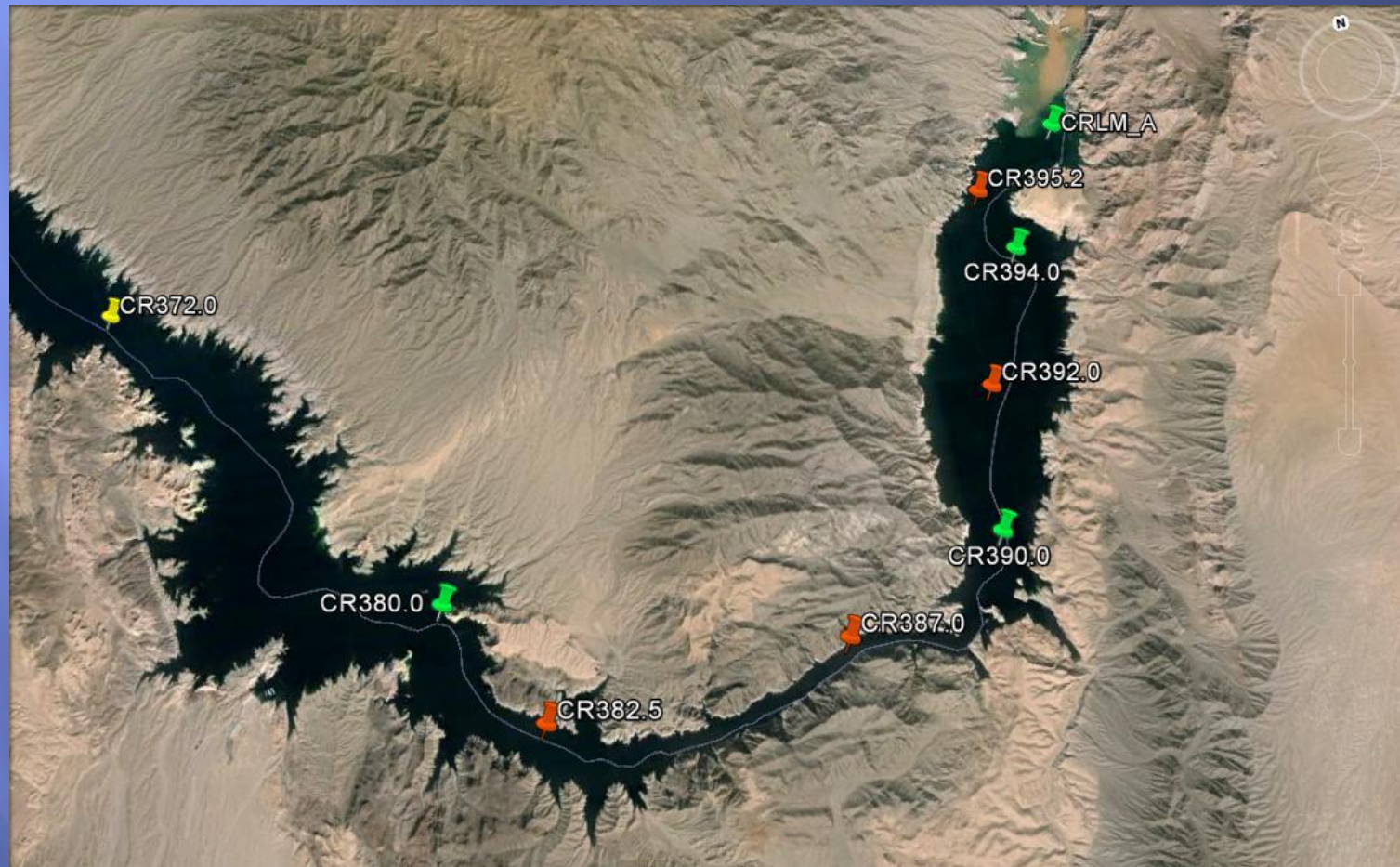




# 2013 HFE Sites

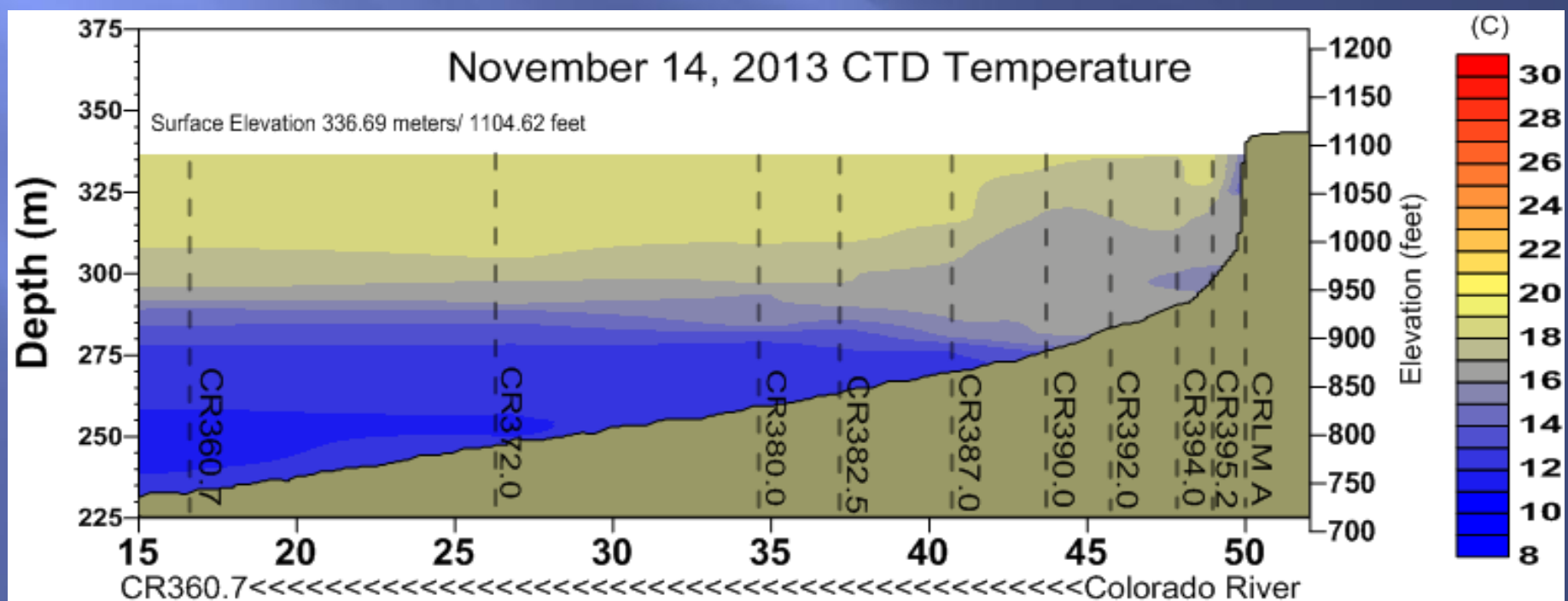
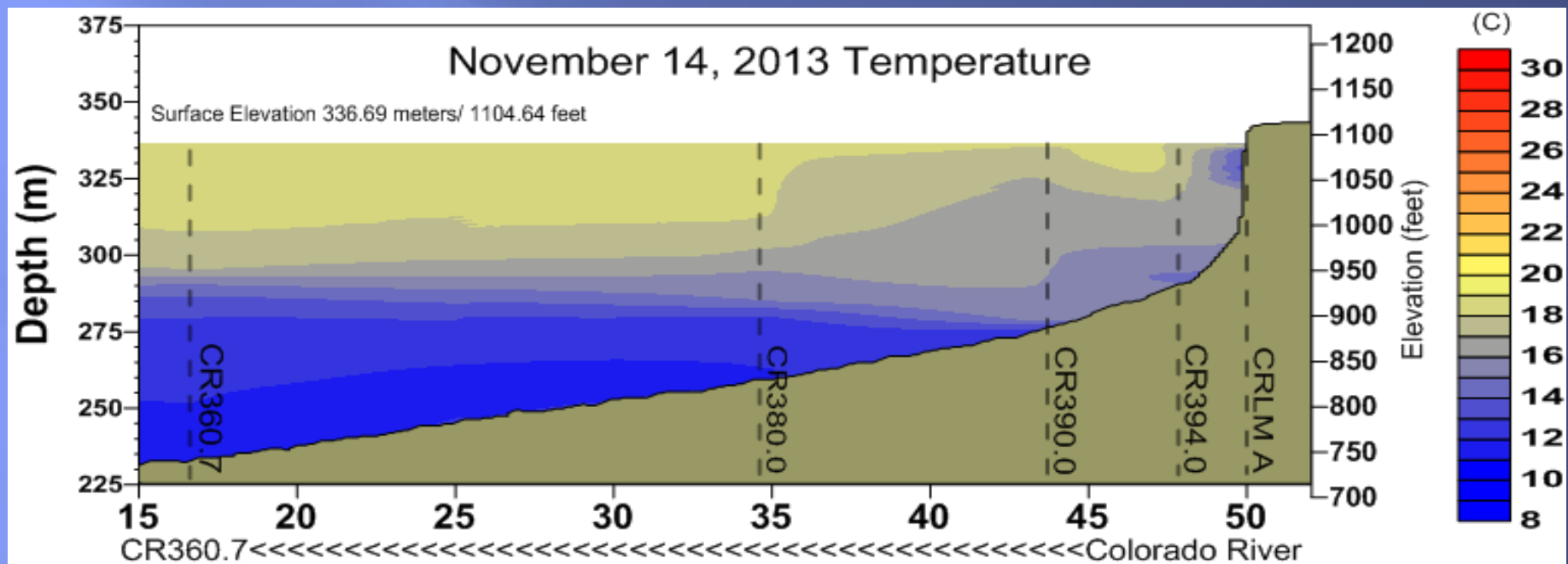


# Colorado Arm Locations

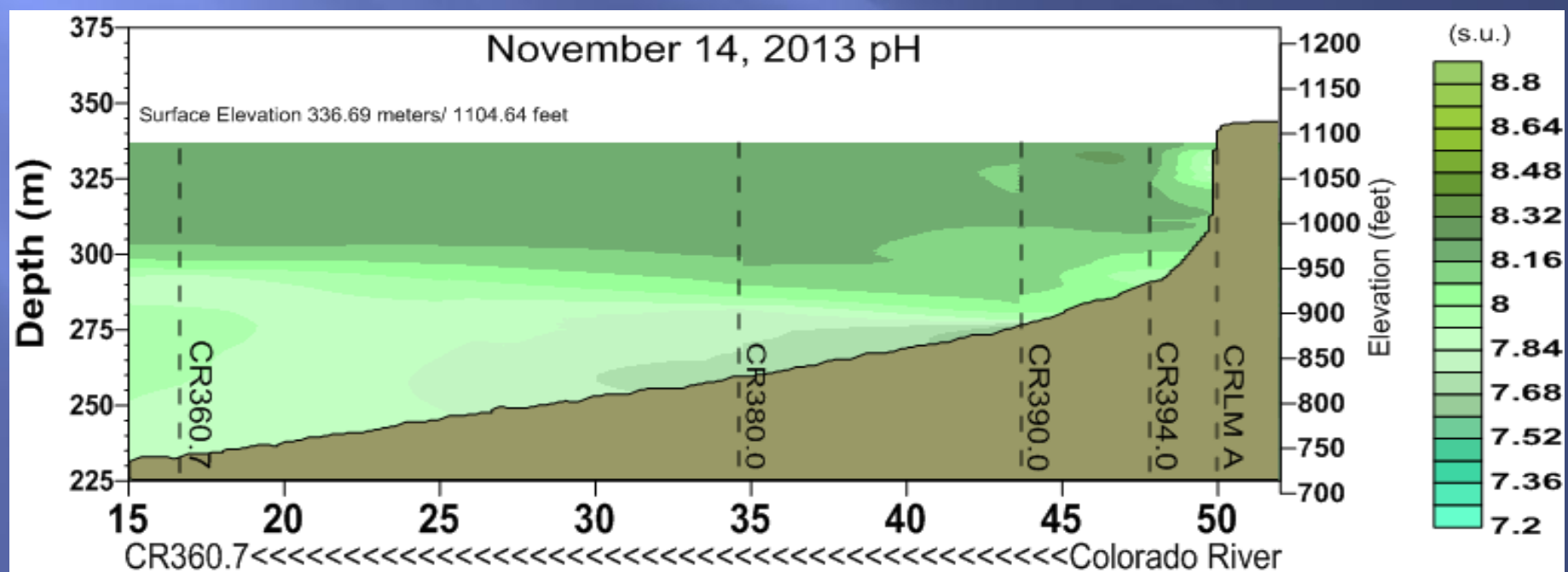
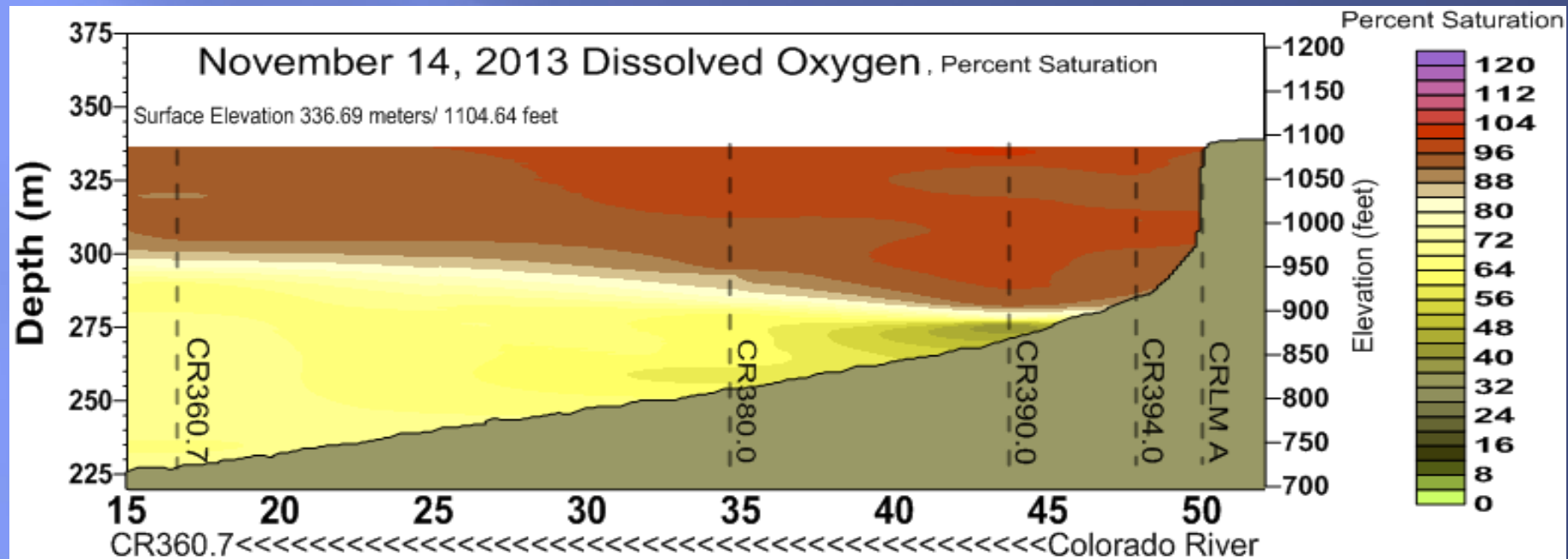




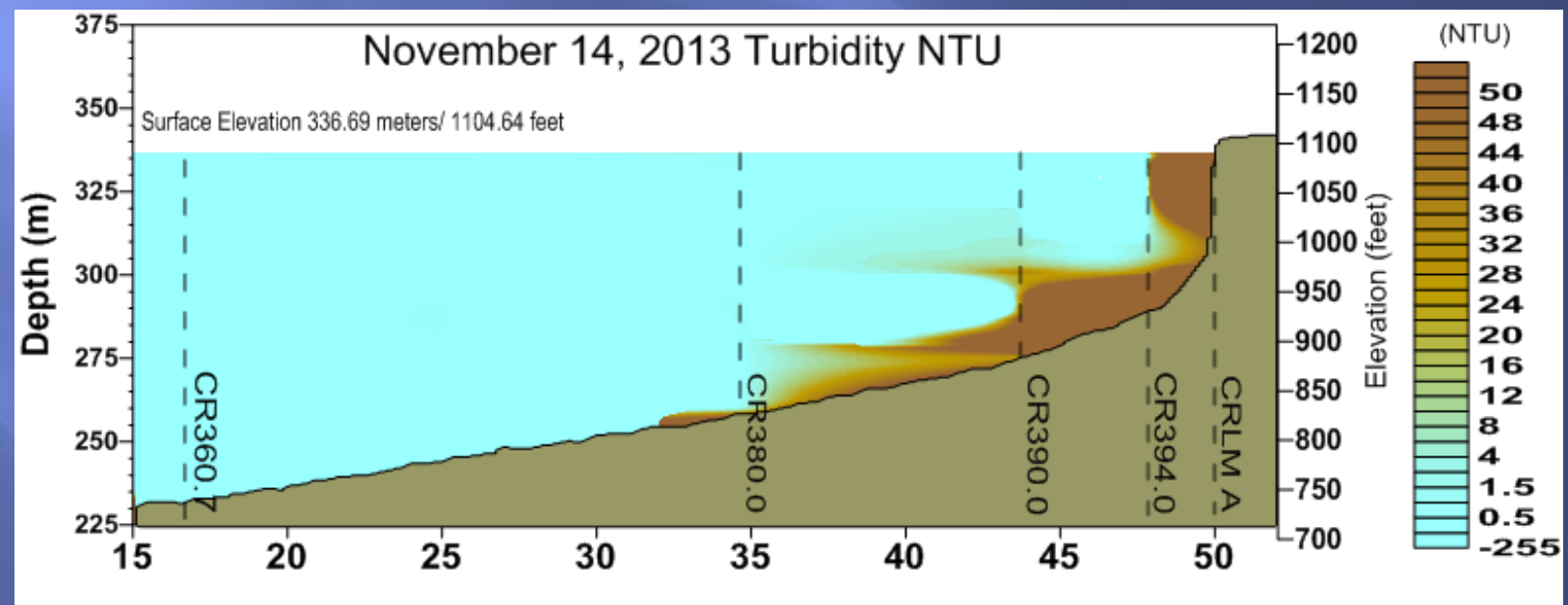
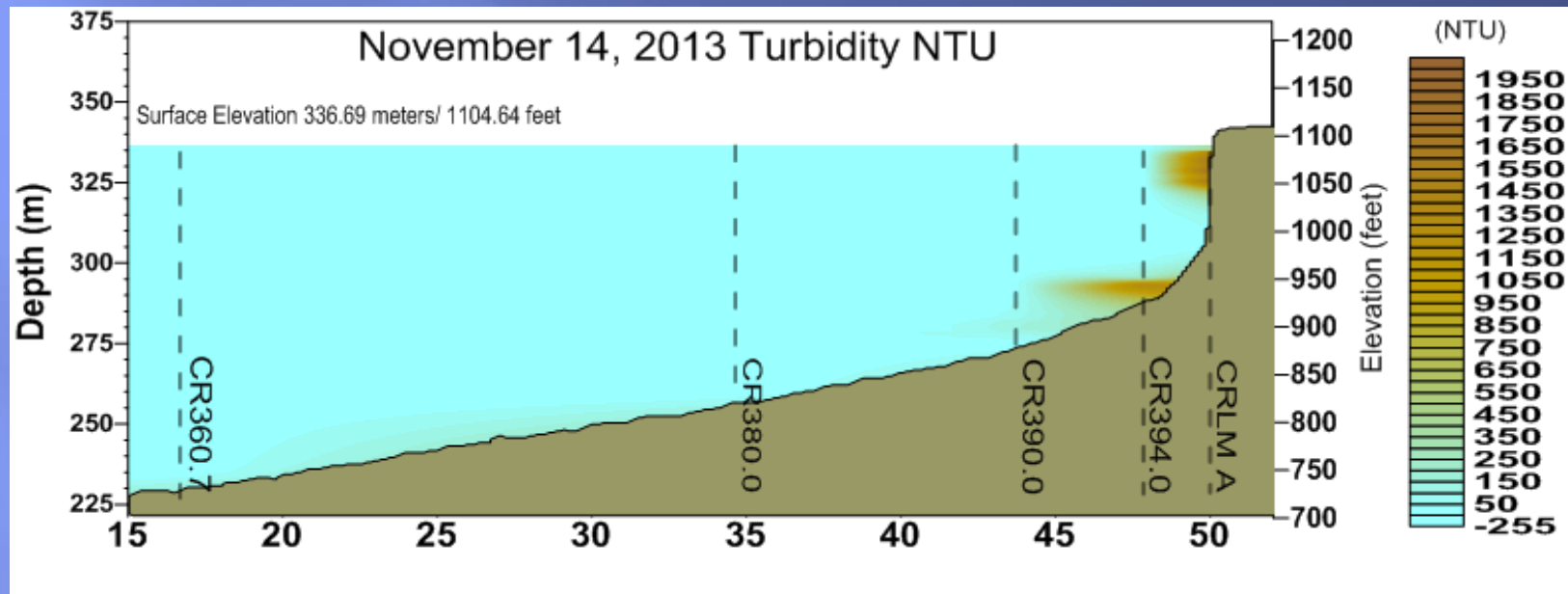
November 14, 2013





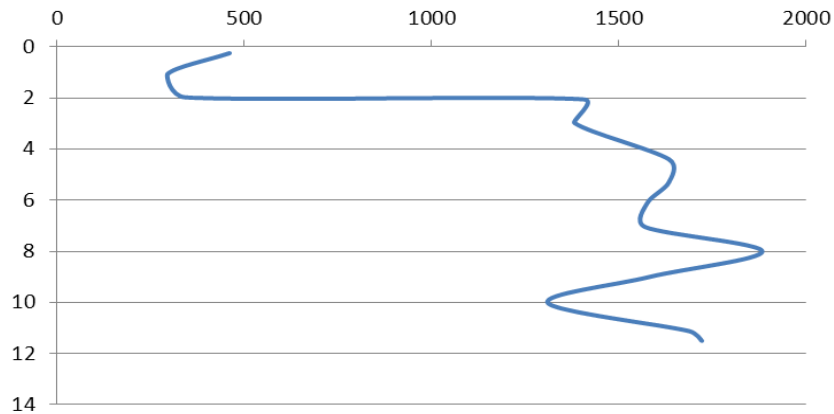




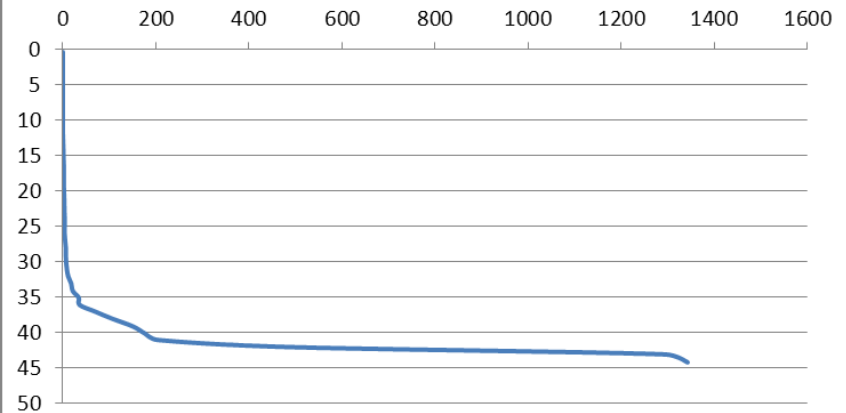


# Turbidity Profiles for November 14

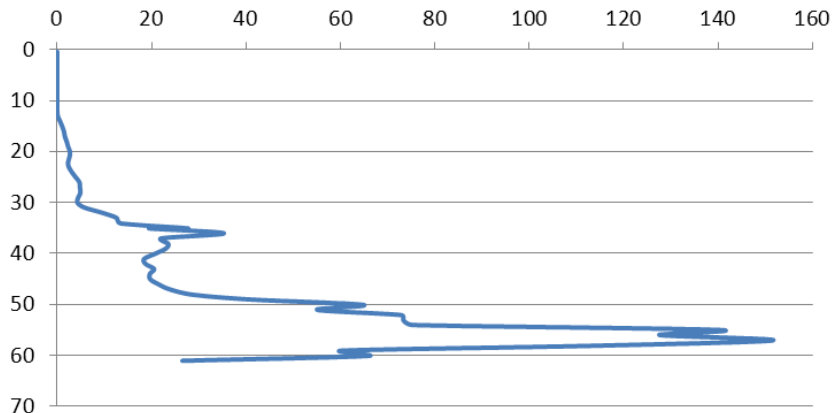
**CRLMA**



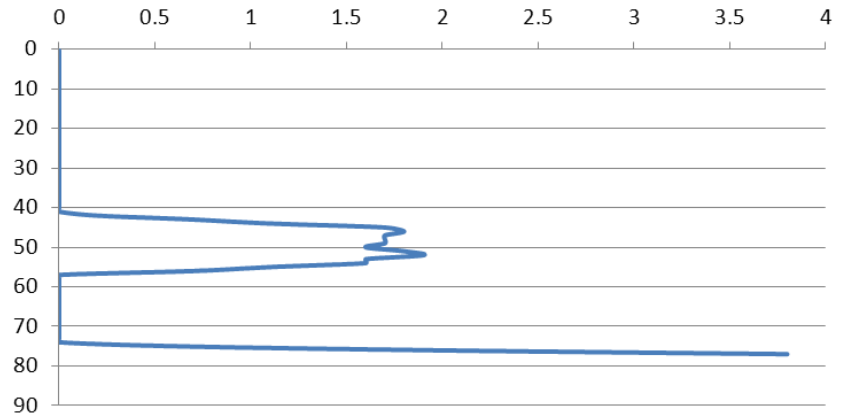
**CR394.0**



**CR390.0**



**CR380.0**

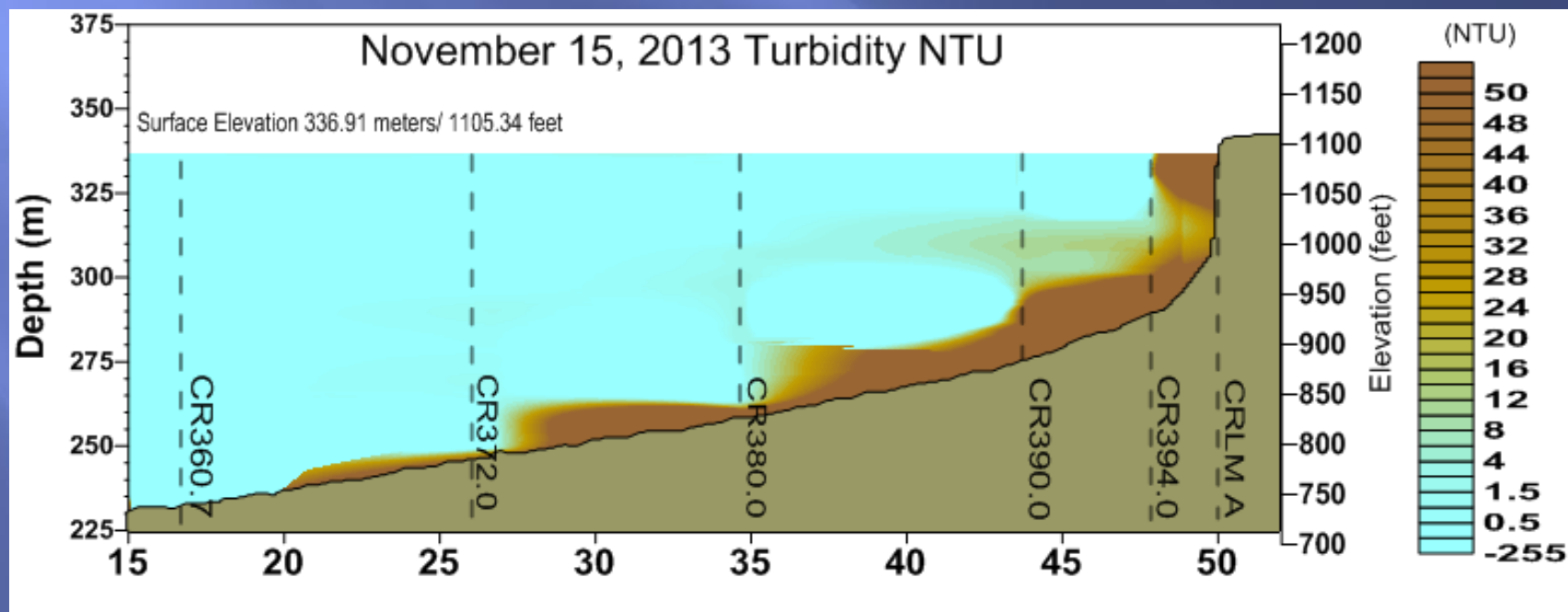
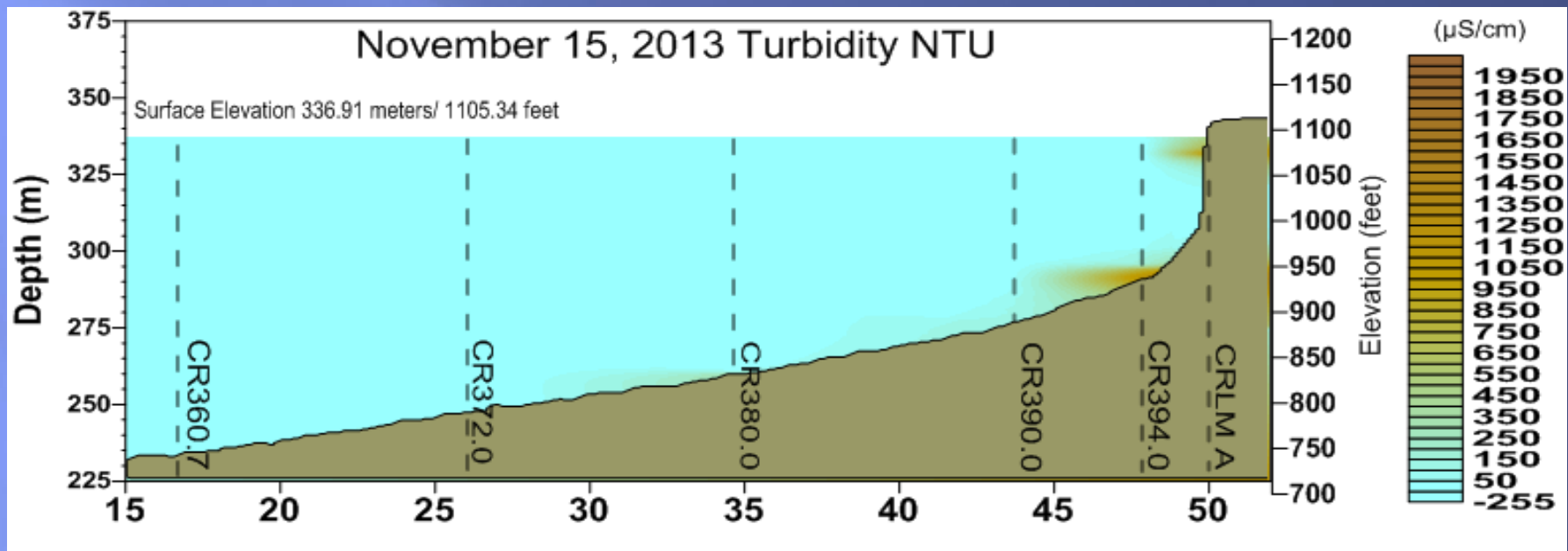


November 15, 2013

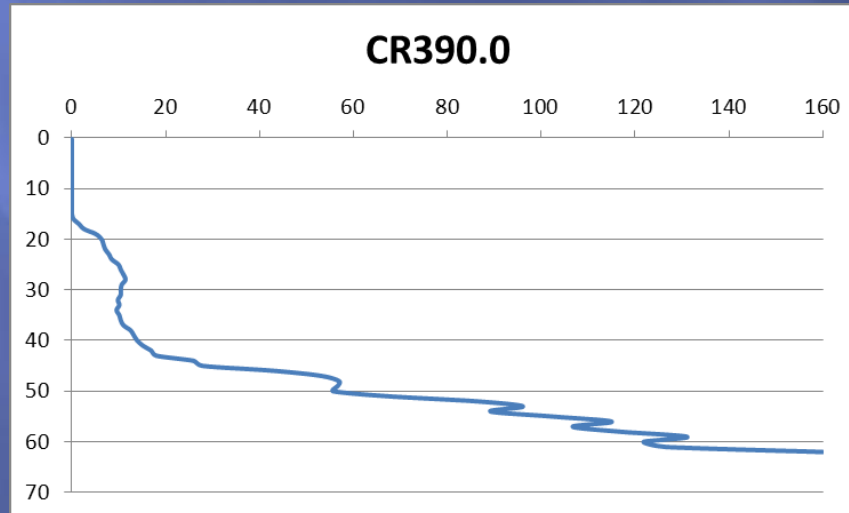
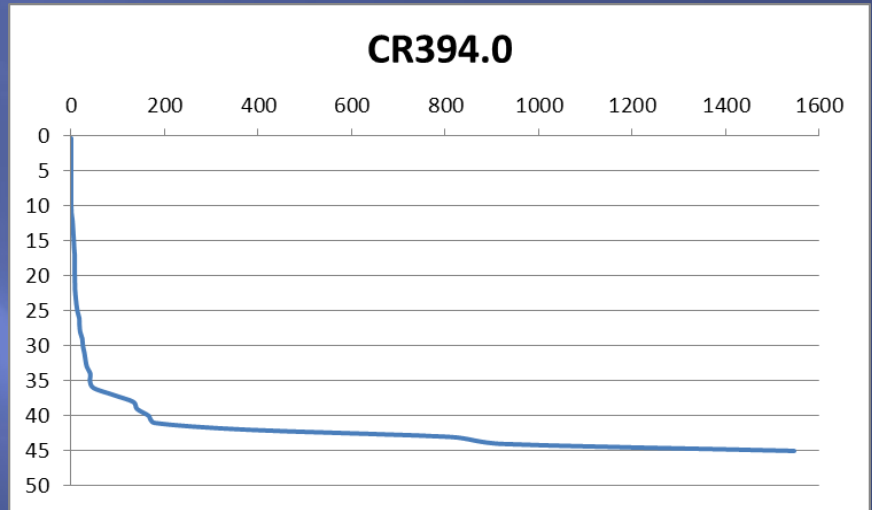
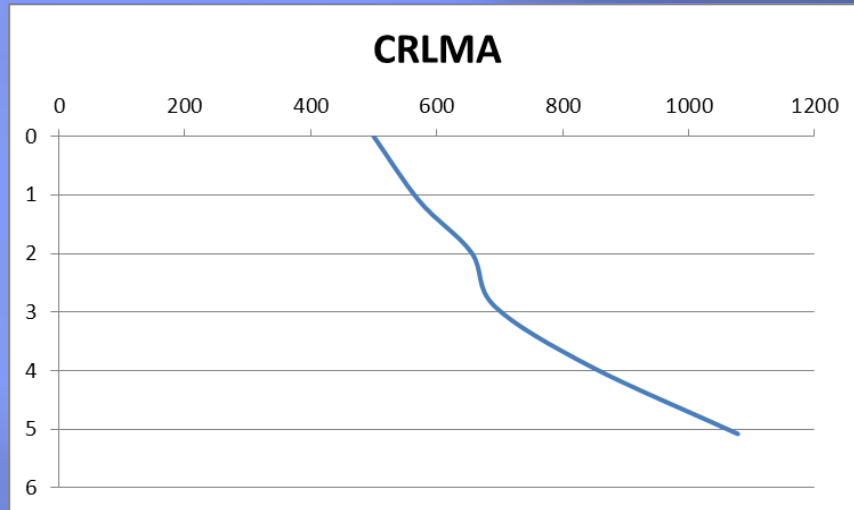






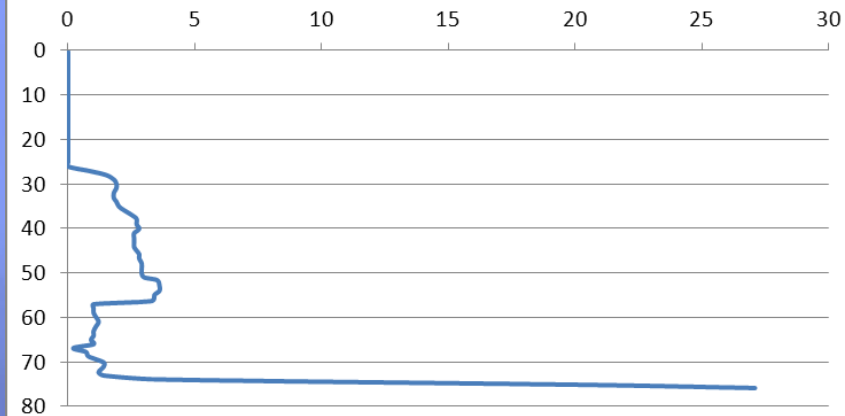


# Turbidity Profiles for November 15

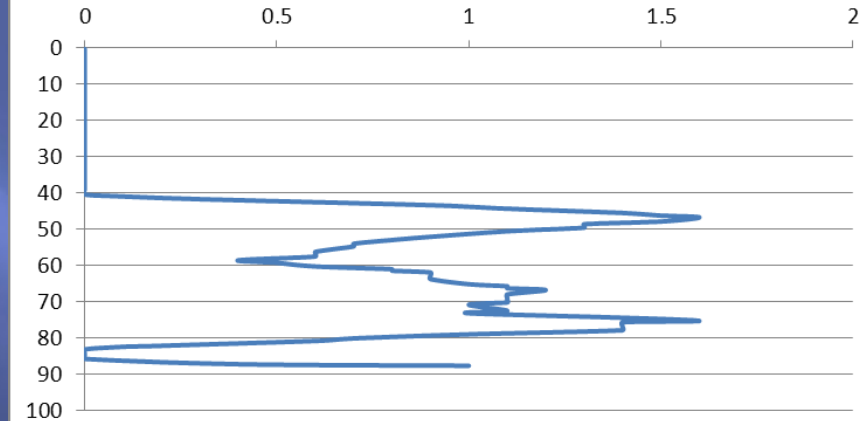


# Turbidity Profiles for November 15

**CR380.0**

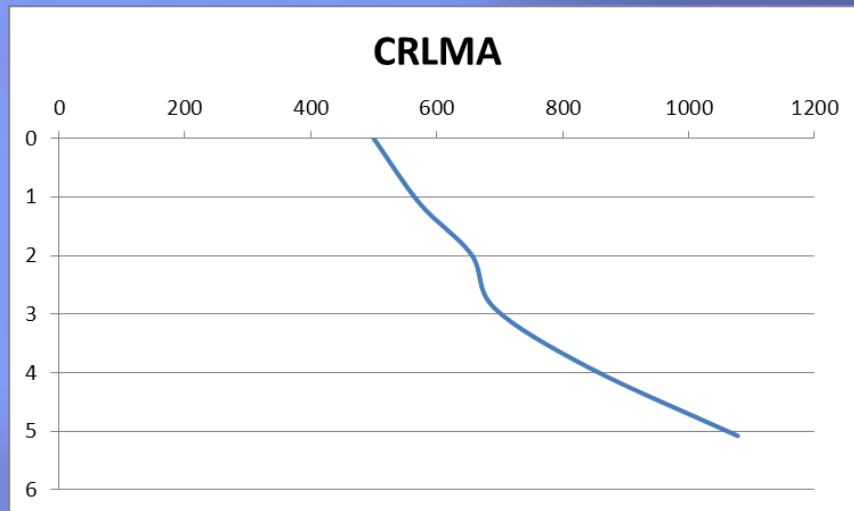


**CR372.0**

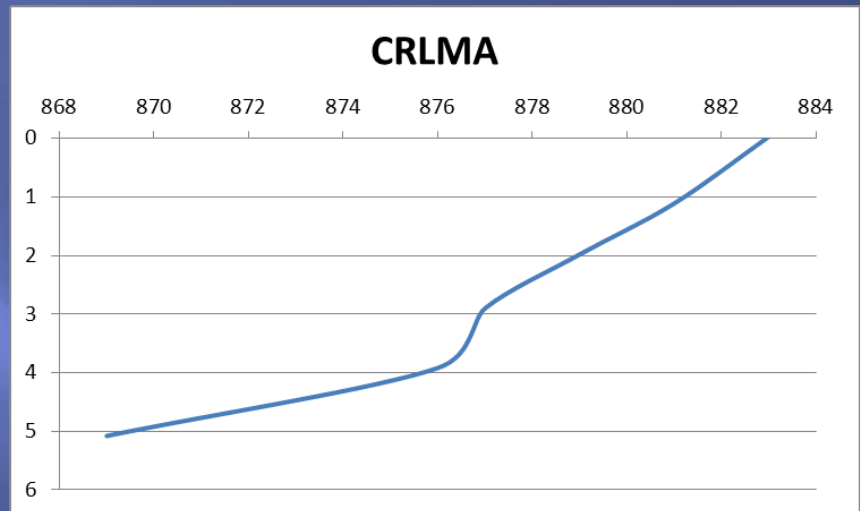




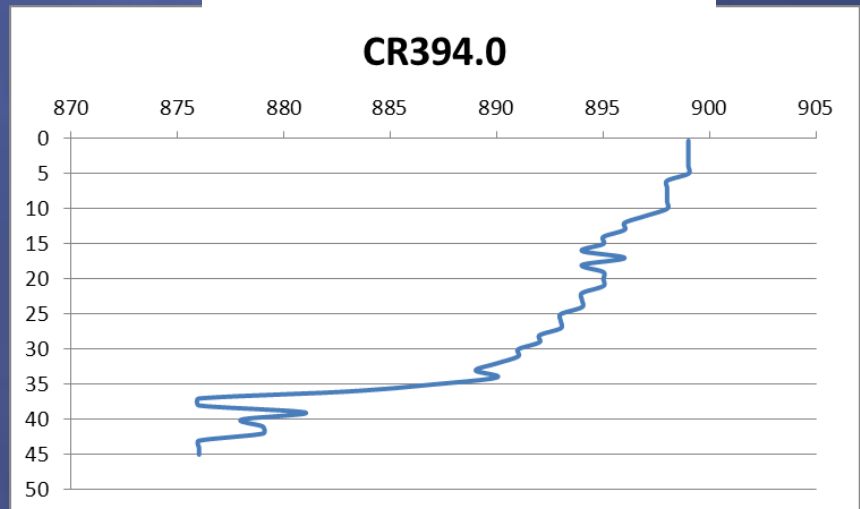
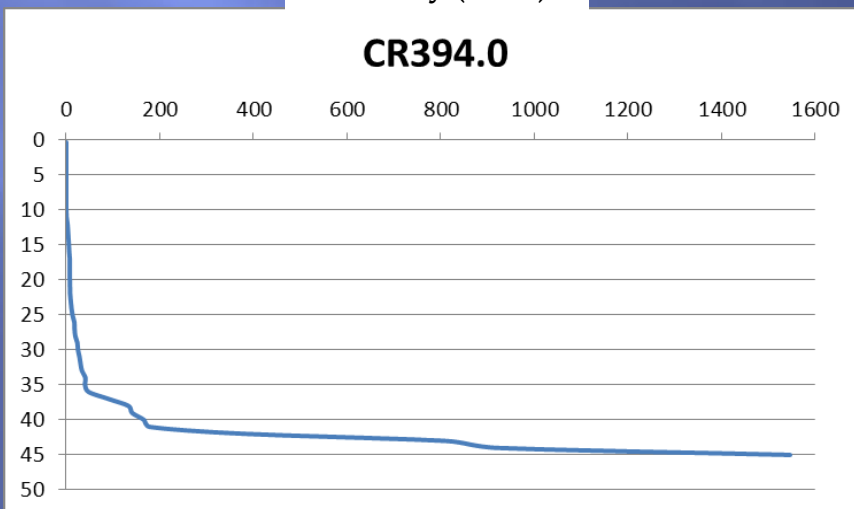
# Turbidity and Conductivity Profiles for November 15



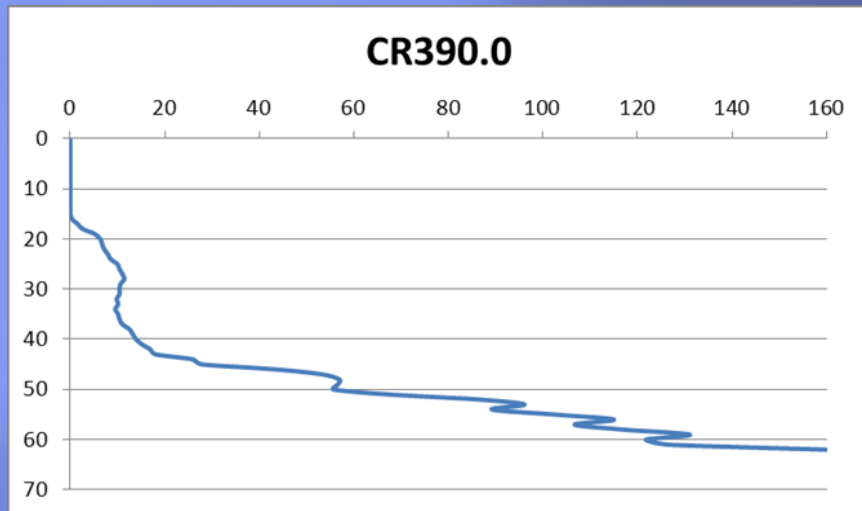
Turbidity (NTU)



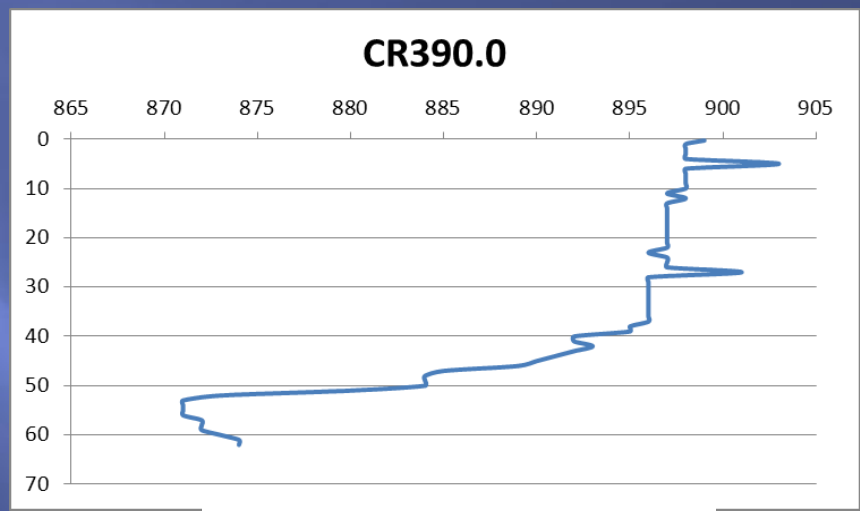
Specific Conductance ( $\mu\text{S}/\text{cm}$ )



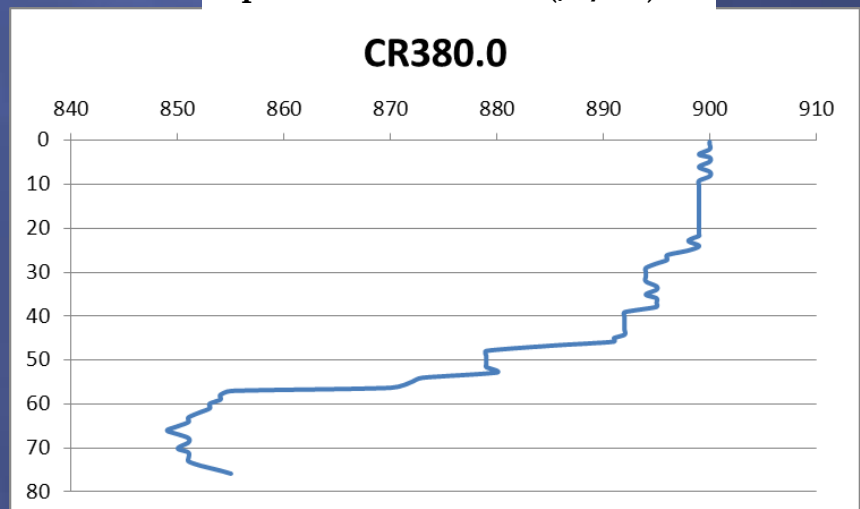
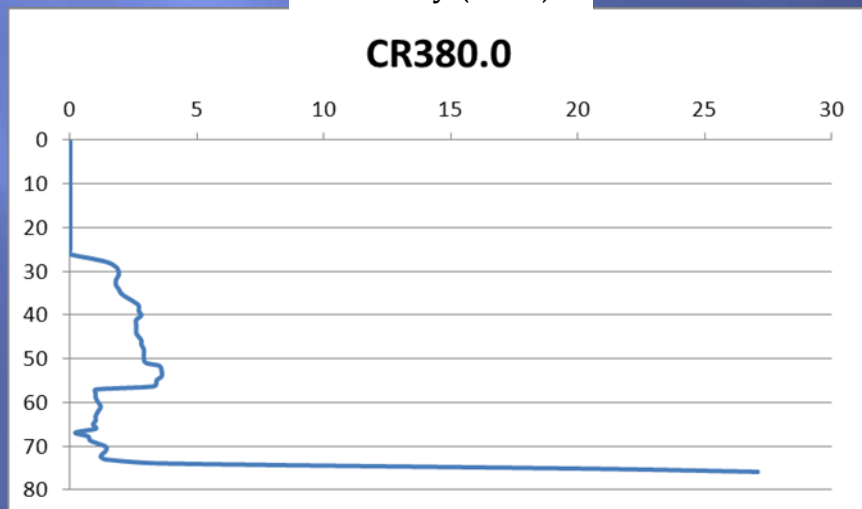
# Turbidity and Conductivity Profiles for November 15



Turbidity (NTU)



Specific Conductance ( $\mu\text{S}/\text{cm}$ )

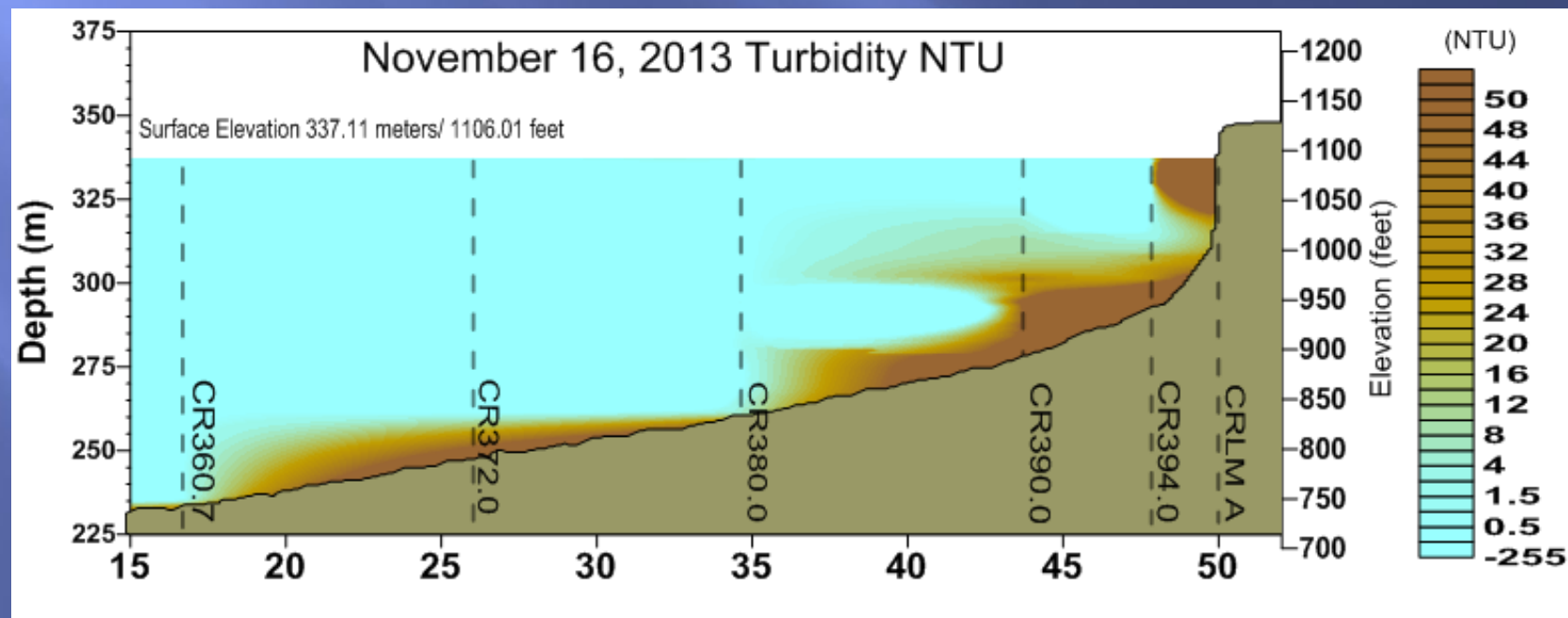
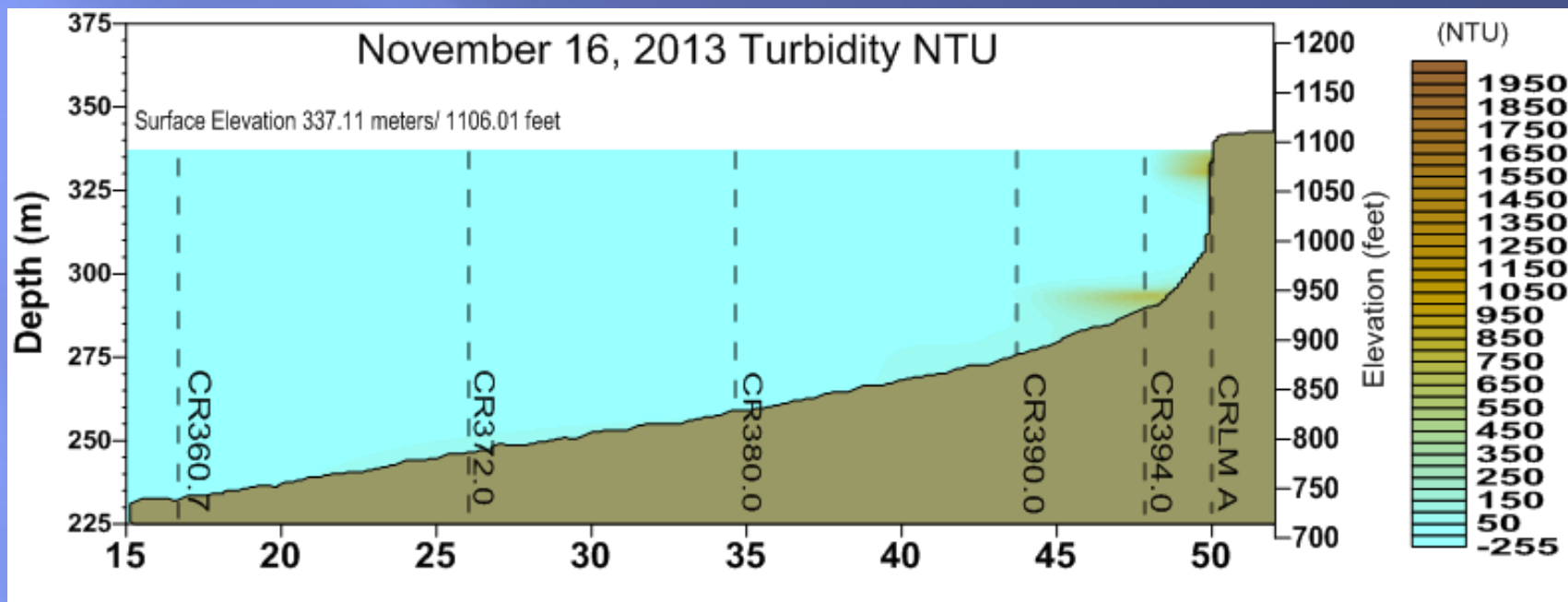


November 16, 2013



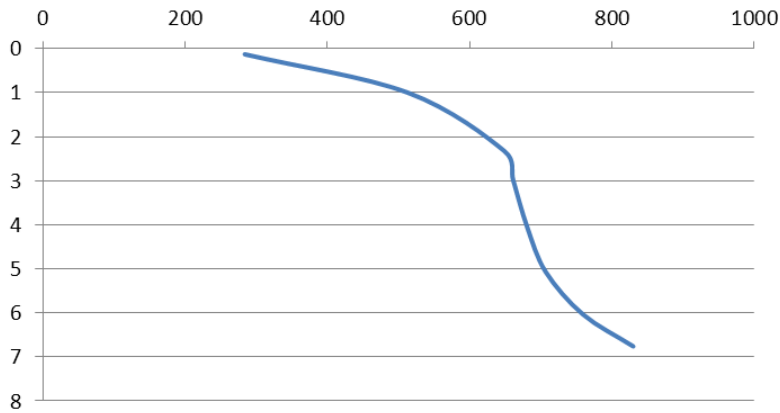




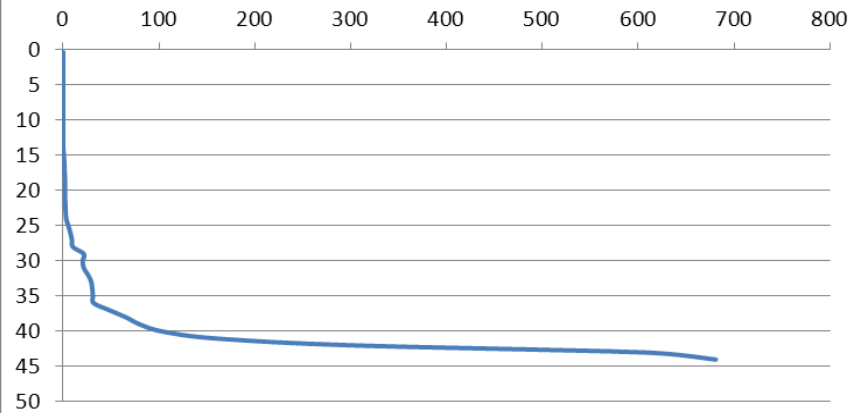


# Turbidity Profiles for November 16

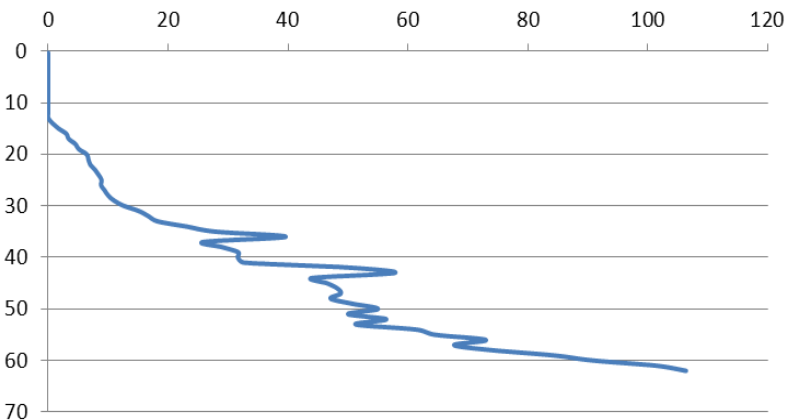
**CRLMA**



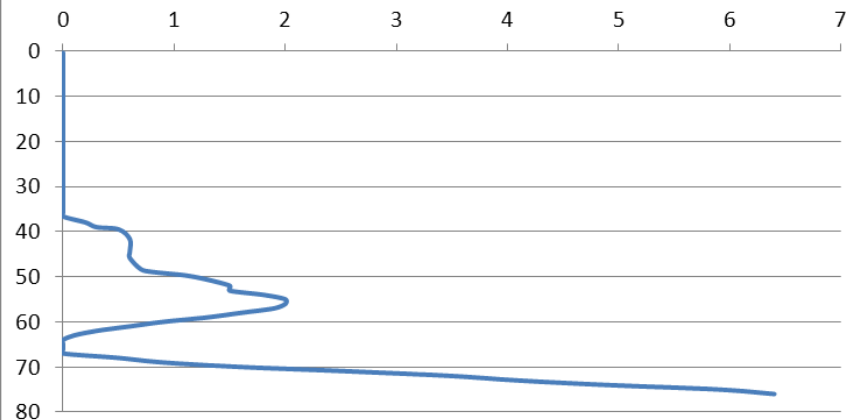
**CR394.0**



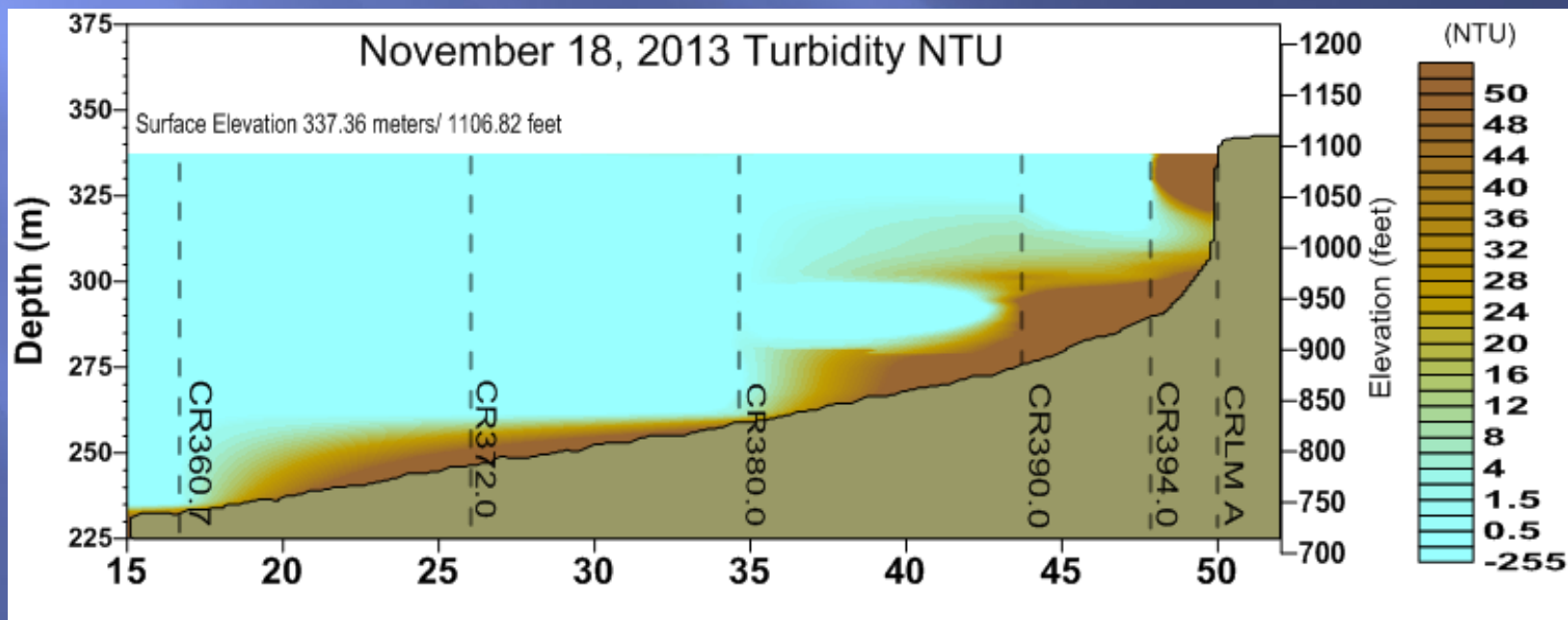
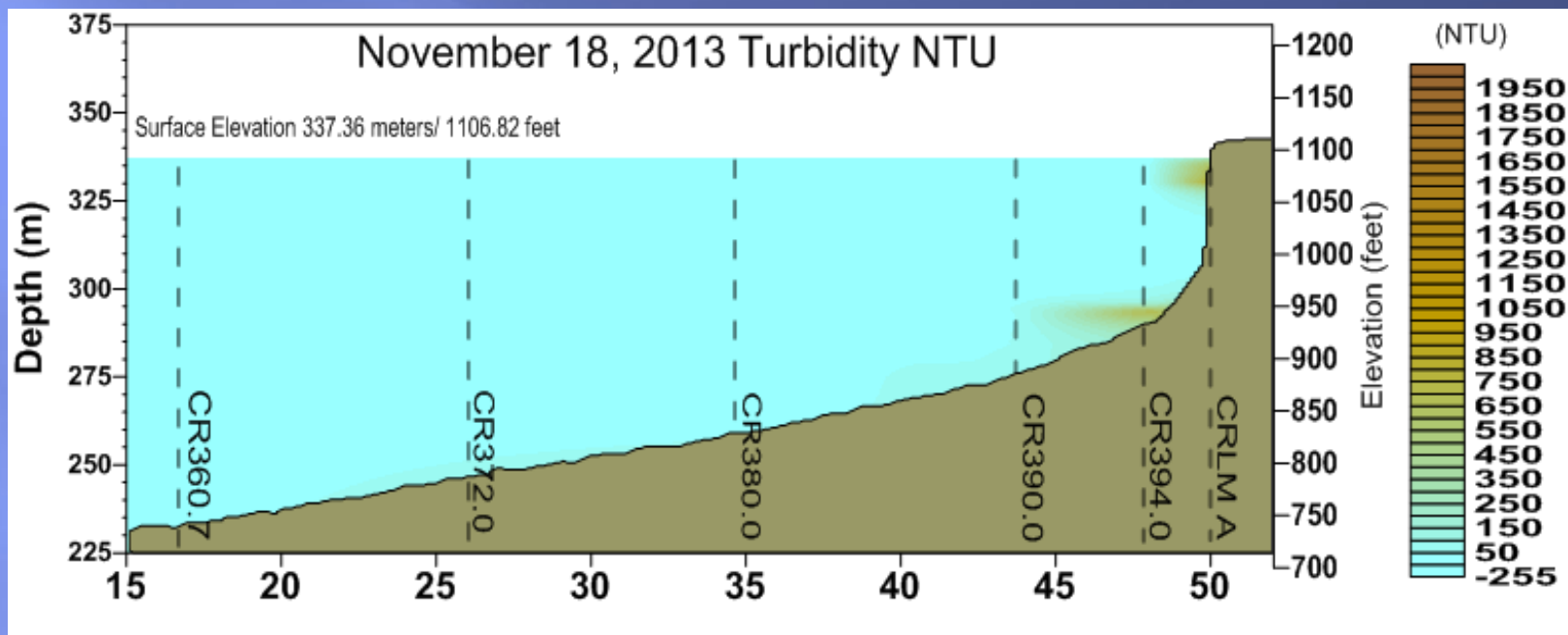
**CR390.0**



**CR380.0**



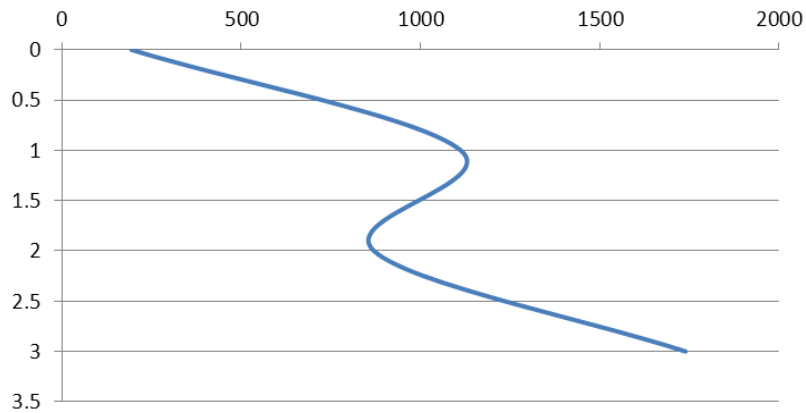
November 18, 2013



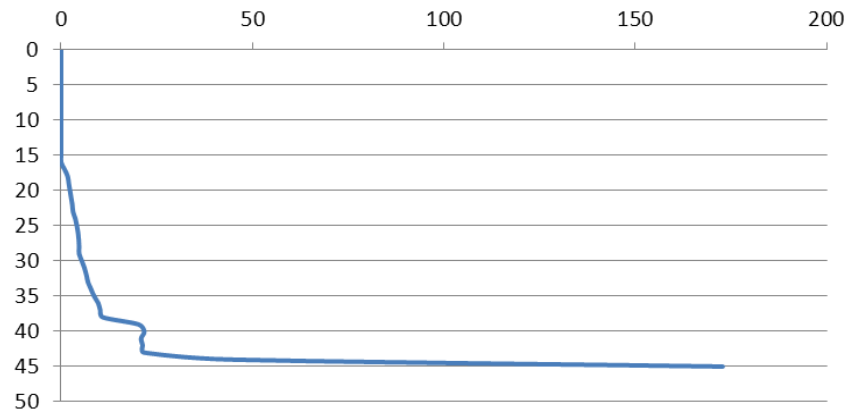


# Turbidity Profiles for November 18

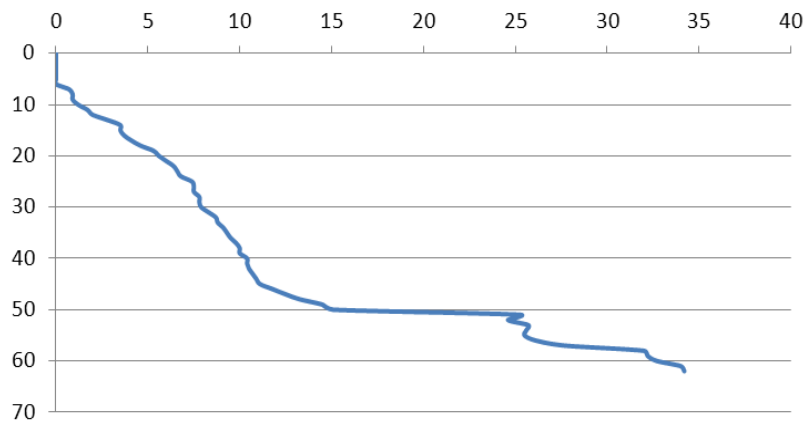
**CRLMA**



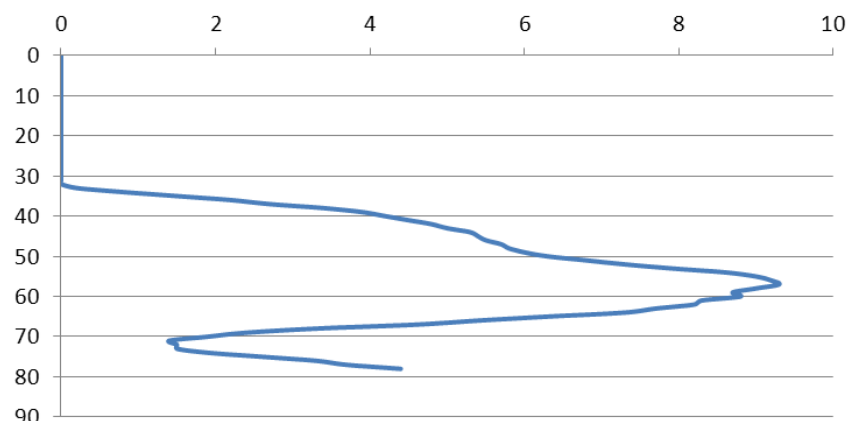
**CR394.0**



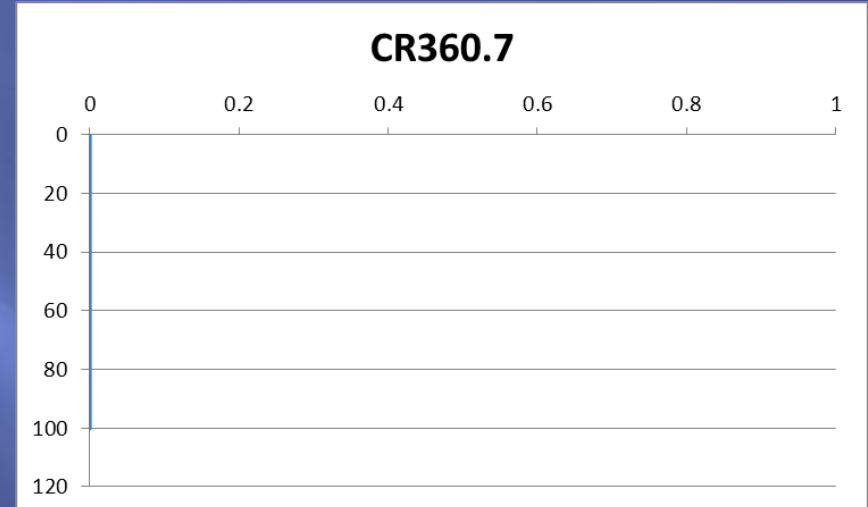
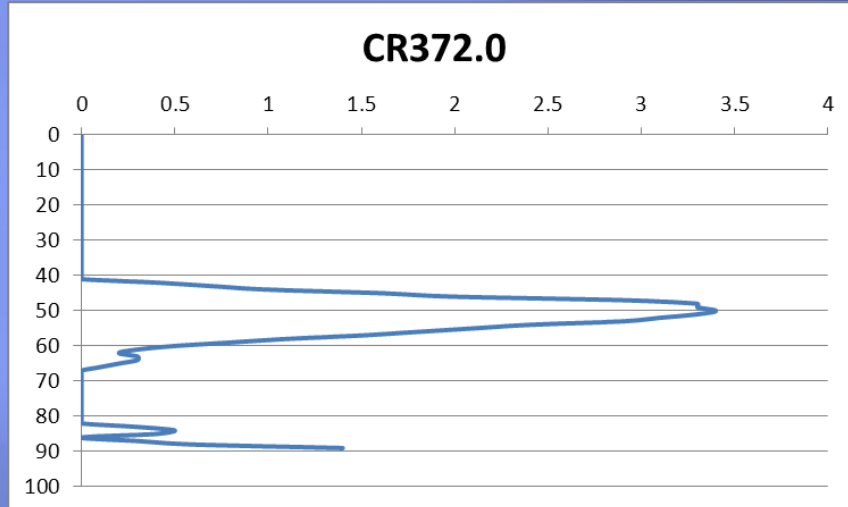
**CR390.0**



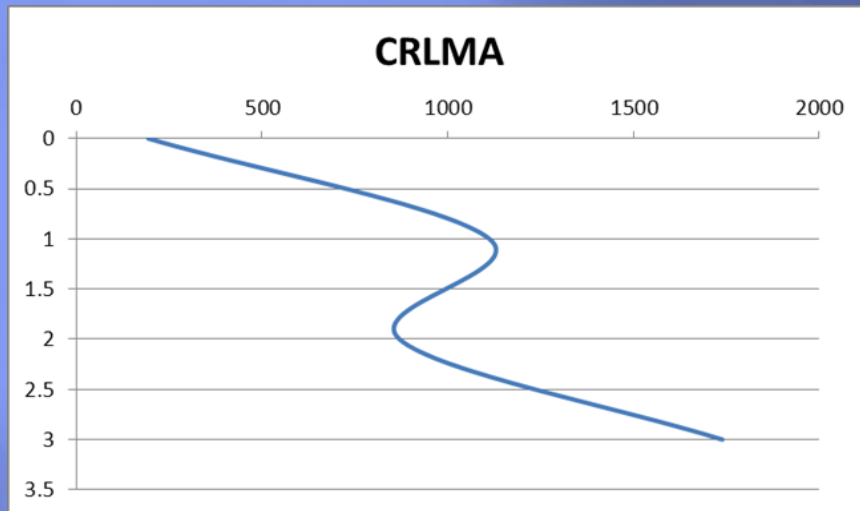
**CR380.0**



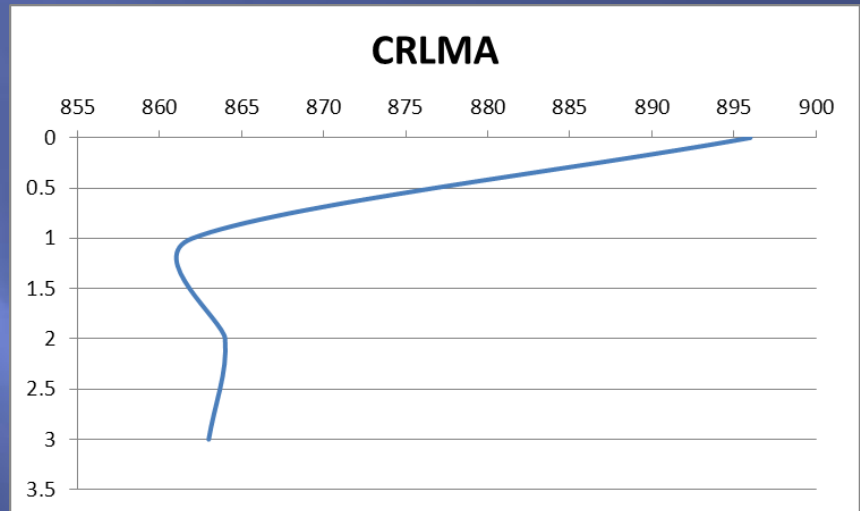
# Turbidity Profiles for November 18



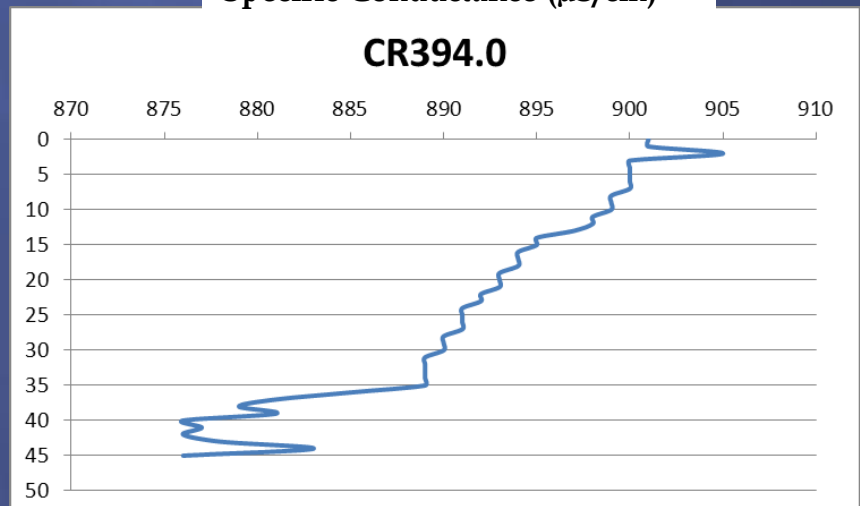
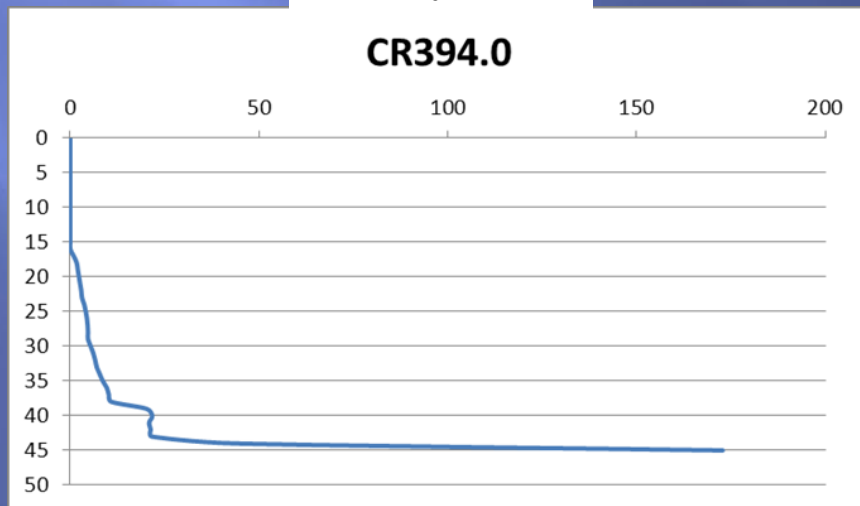
# Turbidity and Conductivity Profiles for November 18



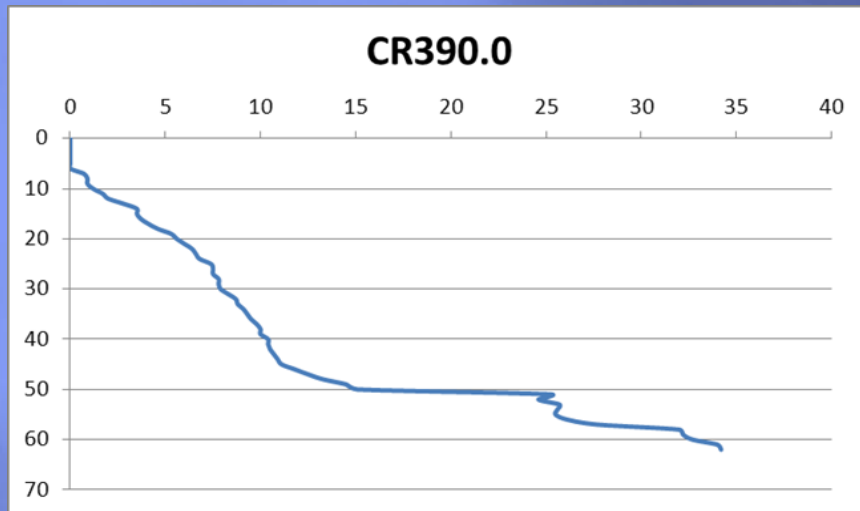
Turbidity (NTU)



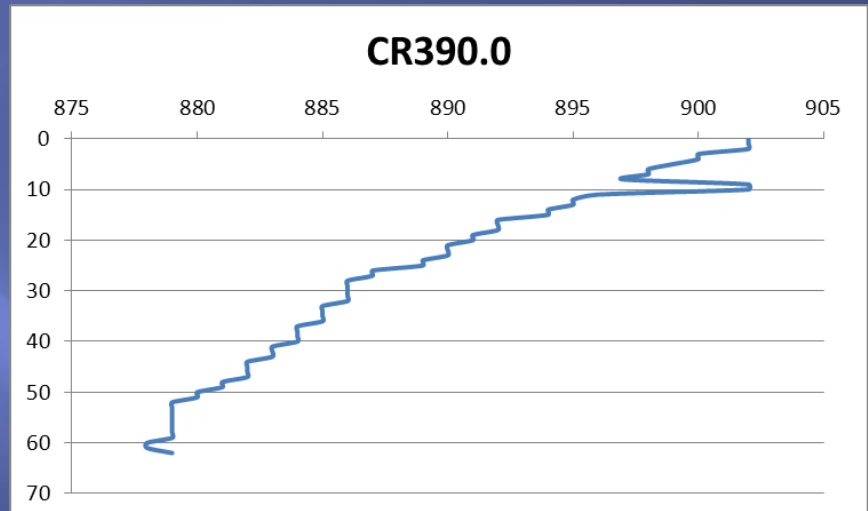
Specific Conductance ( $\mu\text{S}/\text{cm}$ )



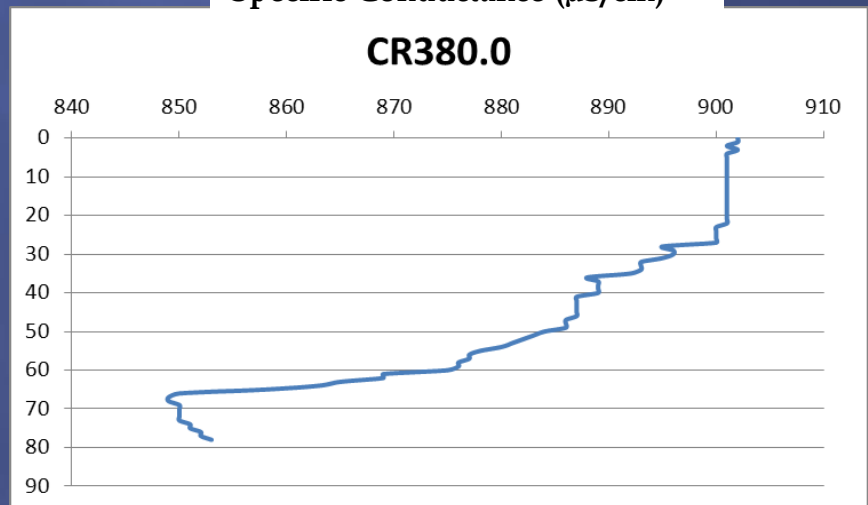
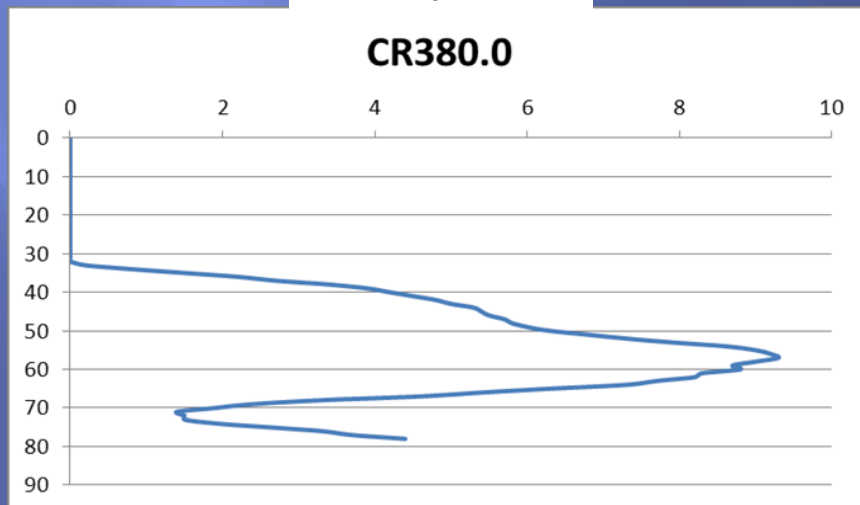
# Turbidity and Conductivity Profiles for November 18



Turbidity (NTU)



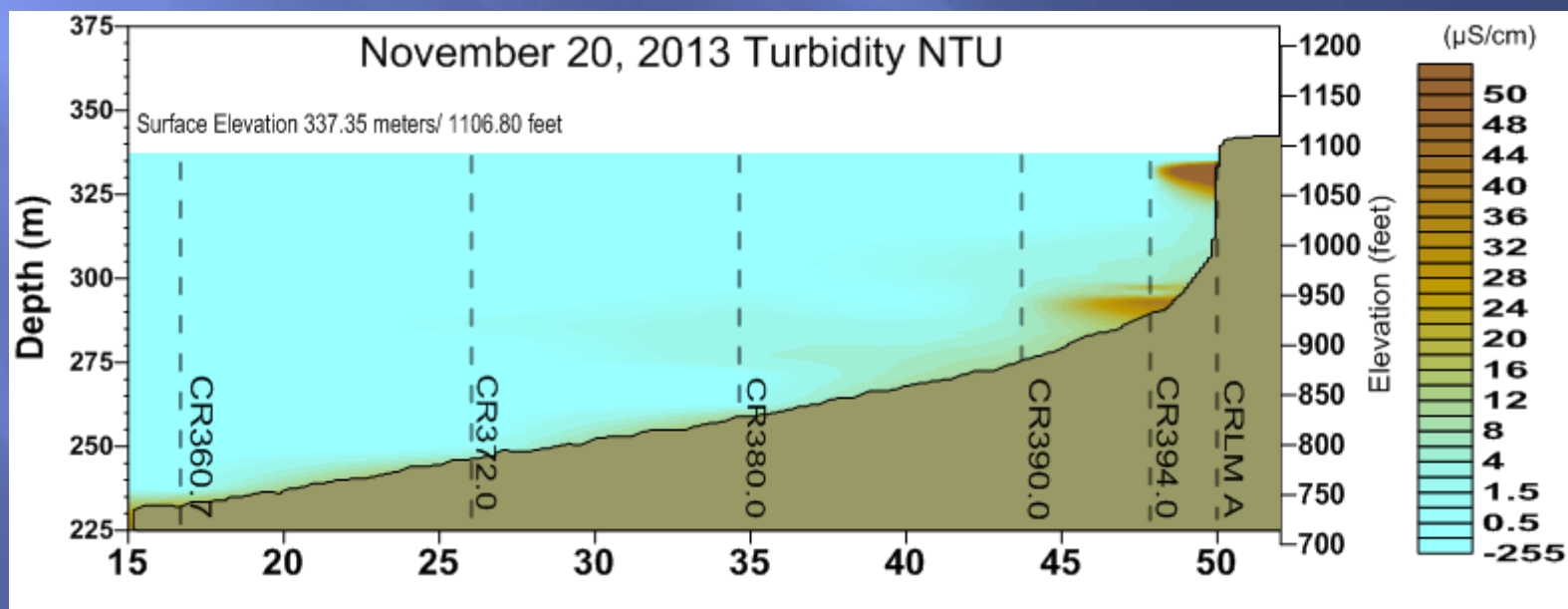
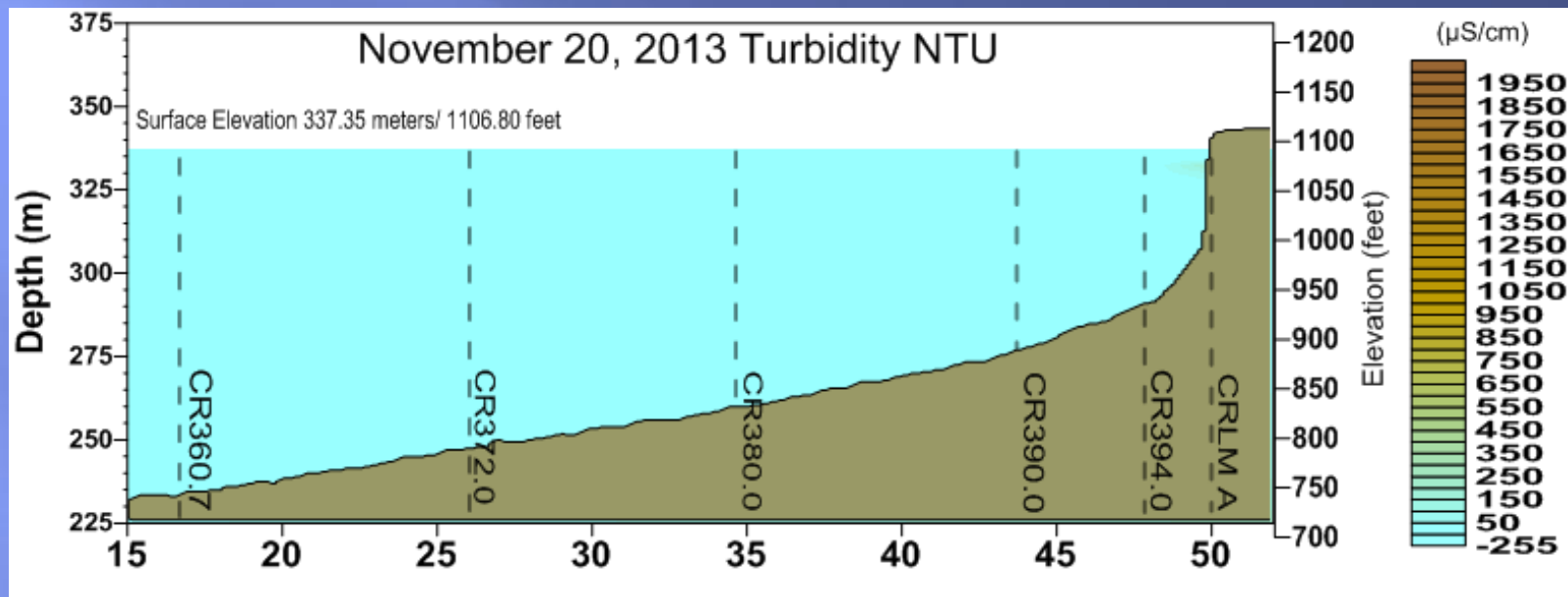
Specific Conductance ( $\mu\text{S}/\text{cm}$ )



November 20, 2013



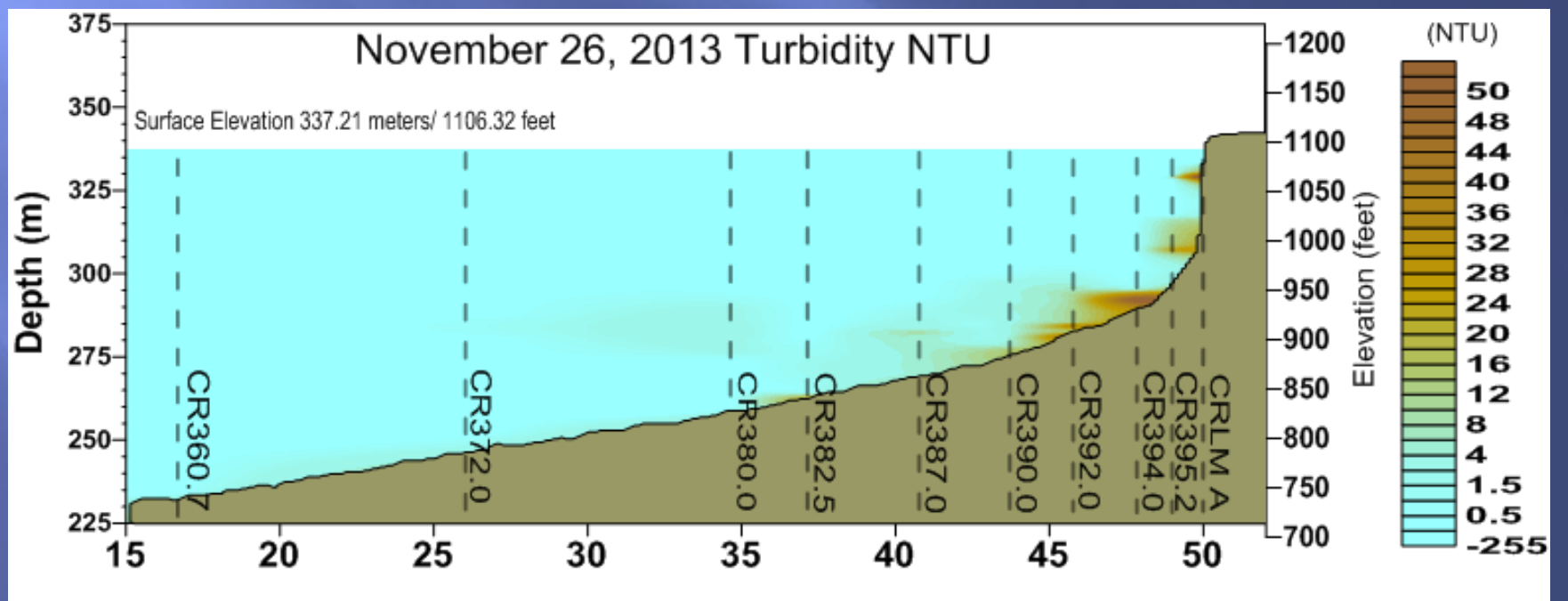
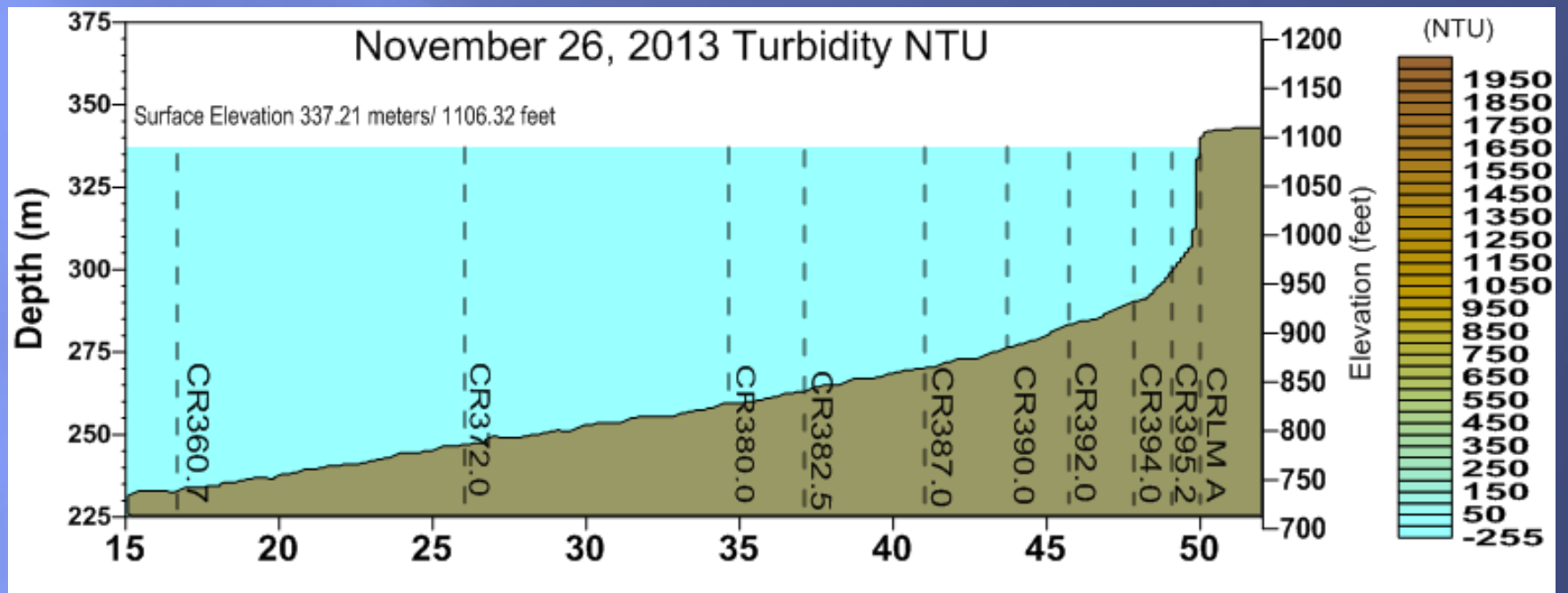




November 26, 2013

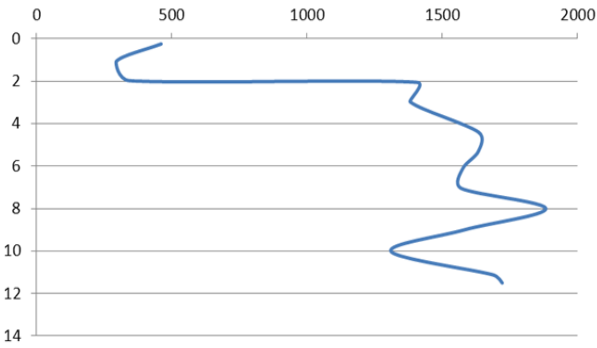






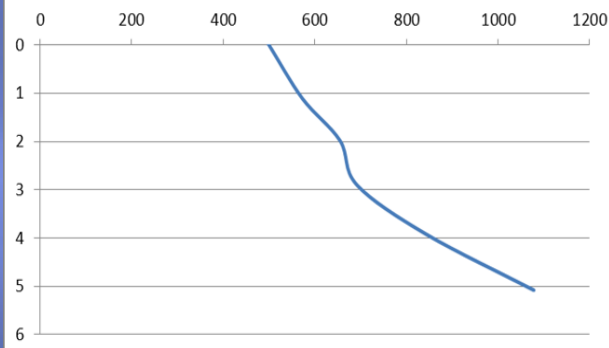
# Turbidity Profiles CRLMA

CRLMA



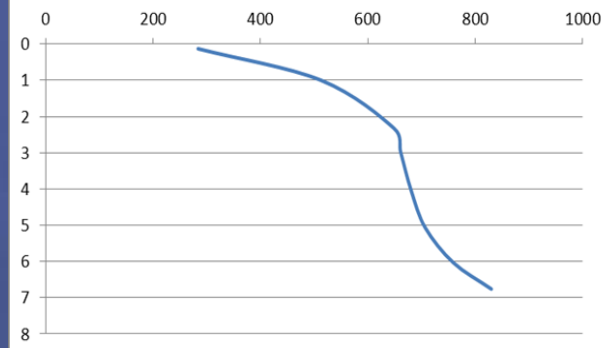
November 14

CRLMA



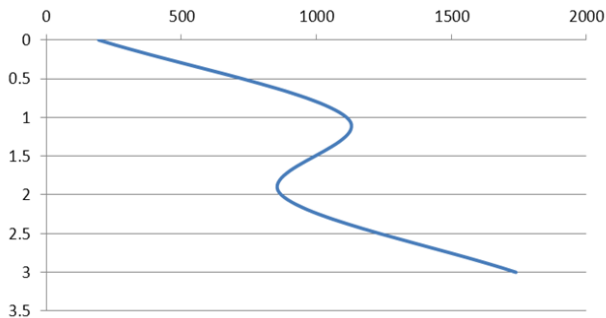
November 15

CRLMA



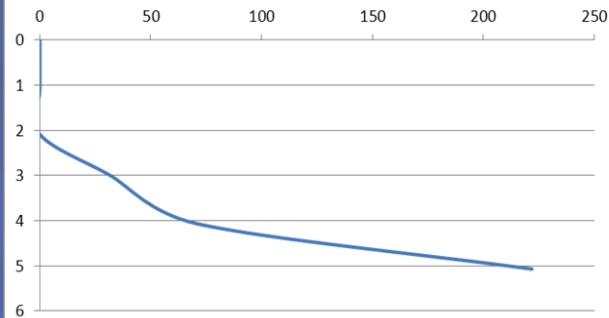
November 16

CRLMA



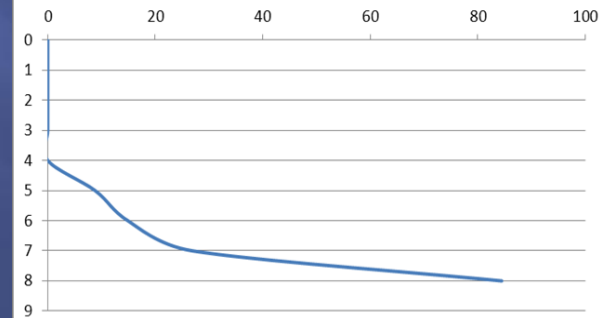
November 18

CRLMA



November 20

CRLMA

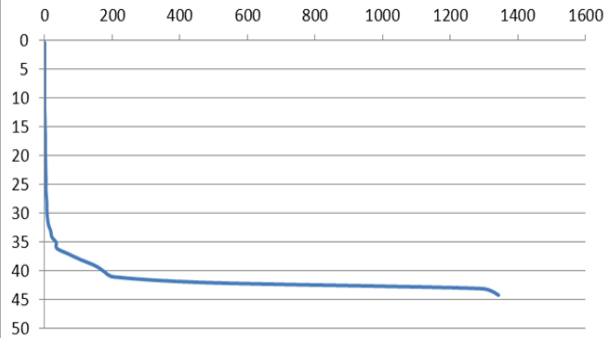


November 26



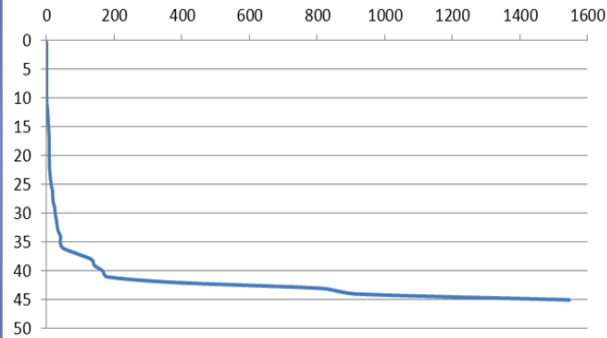
# Turbidity Profiles CR394.0

CR394.0



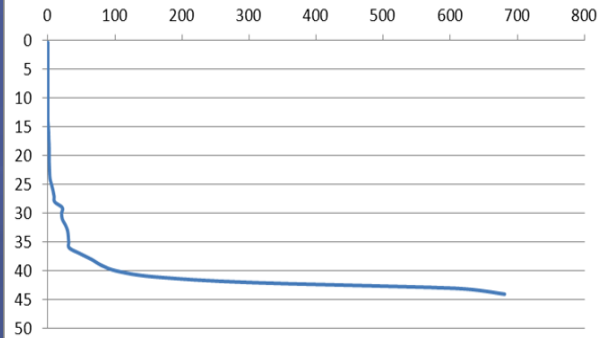
November 14

CR394.0



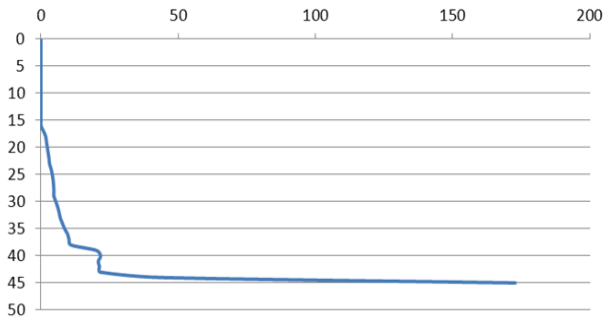
November 15

CR394.0



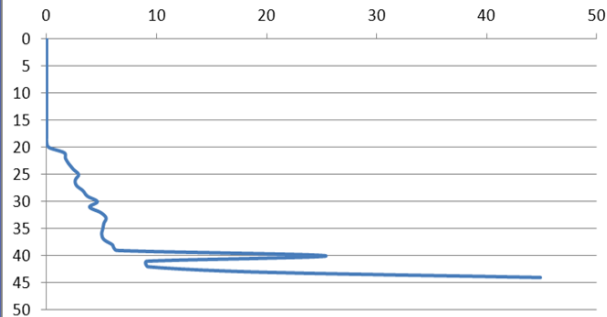
November 16

CR394.0



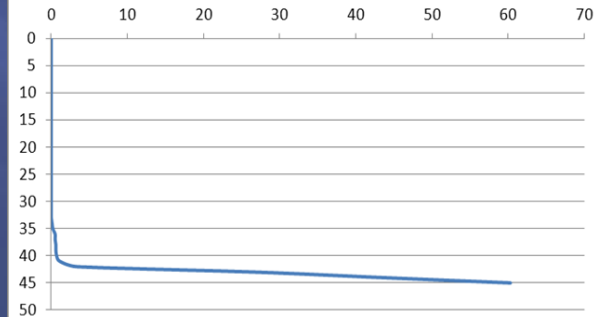
November 18

CR394.0



November 20

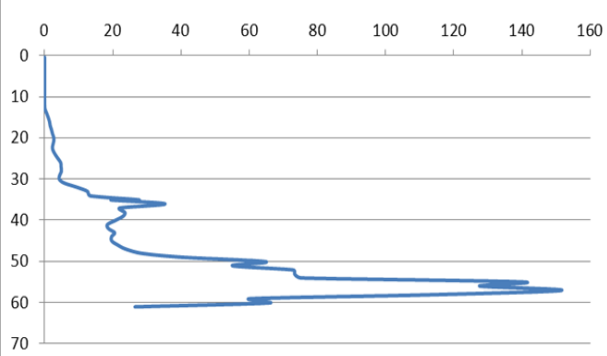
CR394.0



November 26

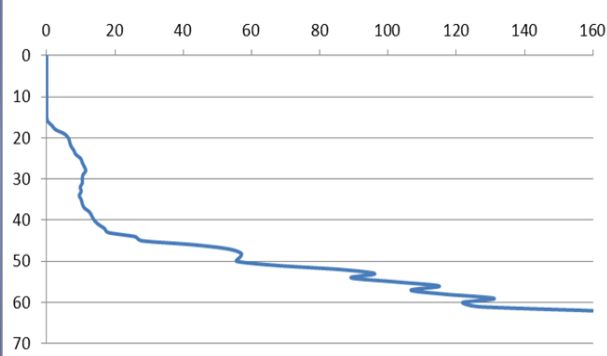
# Turbidity Profiles CR390.0

CR390.0



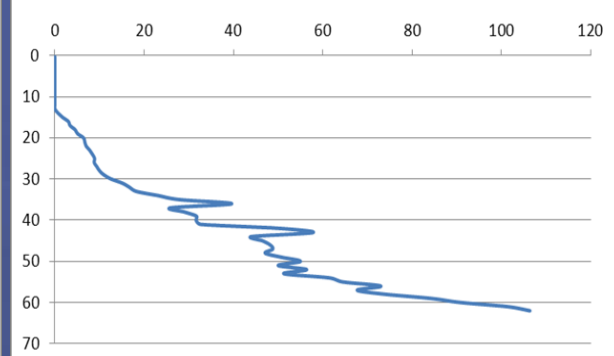
November 14

CR390.0



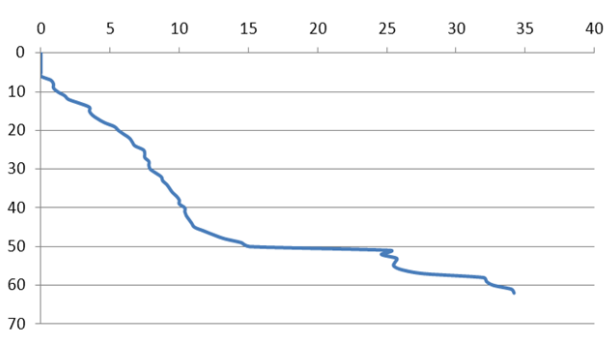
November 15

CR390.0



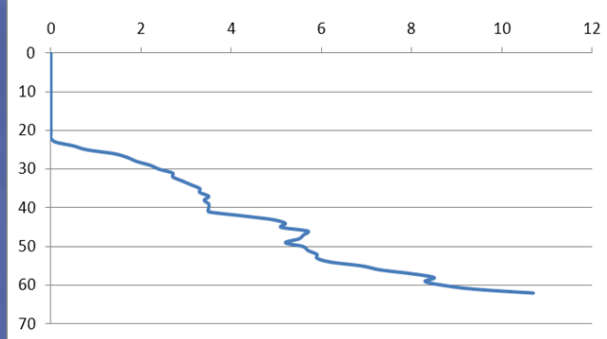
November 16

CR390.0



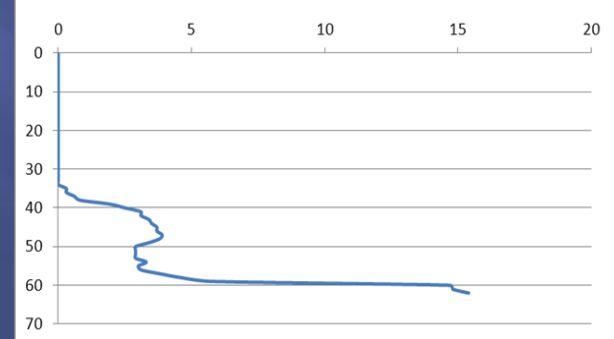
November 18

CR390.0



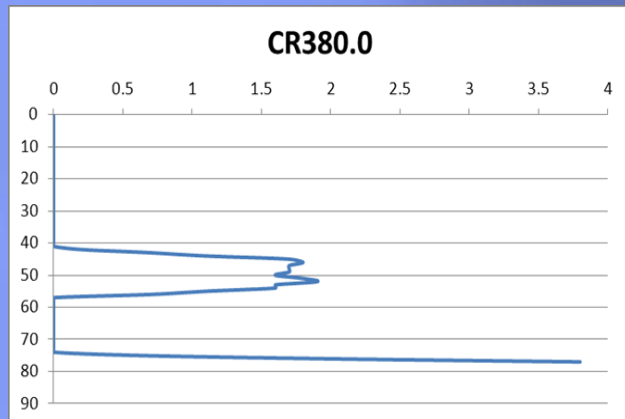
November 20

CR390.0

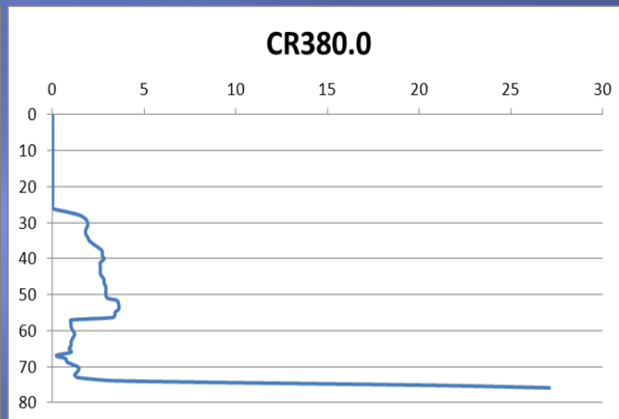


November 26

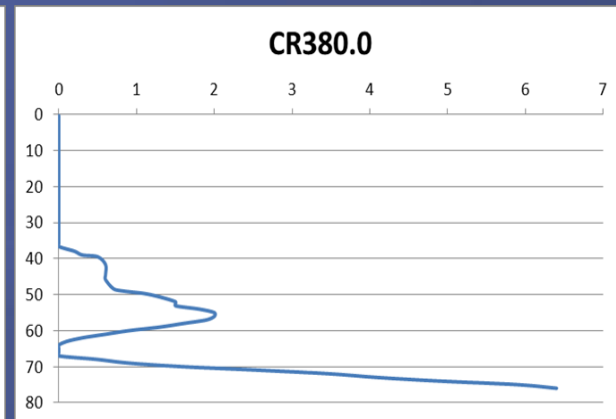
# Turbidity Profiles CR380.0



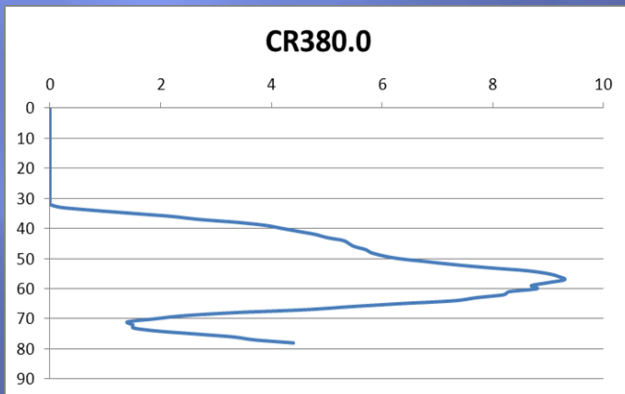
November 14



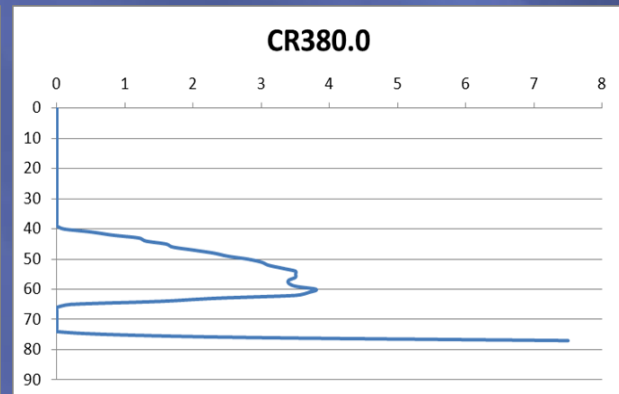
November 15



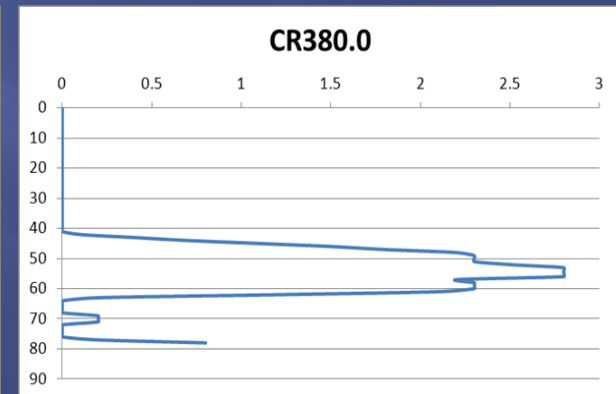
November 16



November 18



November 20



November 26

# Total Nitrogen and Phosphorus

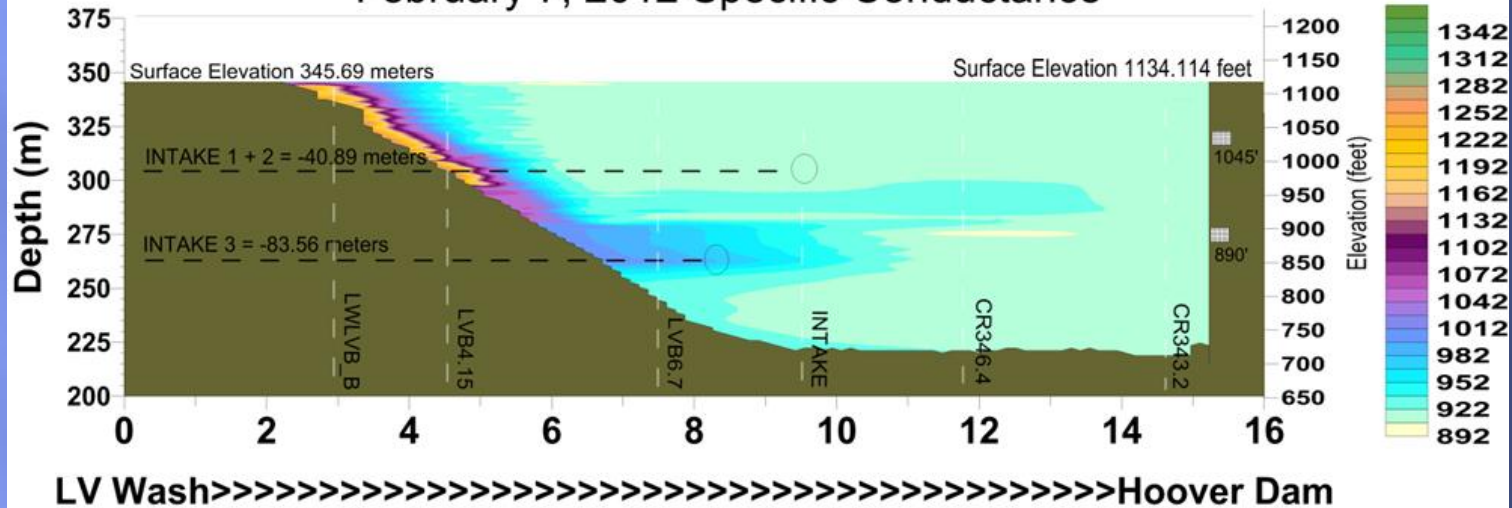
	12-Nov		14-Nov		15-Nov		16-Nov	
	Nitrogen Total (mg/L as N)	Phosphorus Total (mg/L as P)	Nitrogen Total (mg/L as N)	Phosphorus Total (mg/L as P)	Nitrogen Total (mg/L as N)	Phosphorus Total (mg/L as P)	Nitrogen Total (mg/L as N)	Phosphorus Total (mg/L as P)
<b>CRLM_A</b>	<0.5	0.013	<0.5	0.014	<0.5	0.092	0.809	0.077
<b>CR394.0</b>	<0.5	0.018	<0.5	0.23	<0.5	0.16	0.569	0.12
<b>CR390.0</b>	<0.5	0.008	<0.5	0.18	<0.5	0.077	<0.5	0.062
<b>CR380.0</b>	<0.5	0.009	<0.5	0.01	<0.5	0.01	<0.5	0.014

# Glen Canyon HFE, 2013

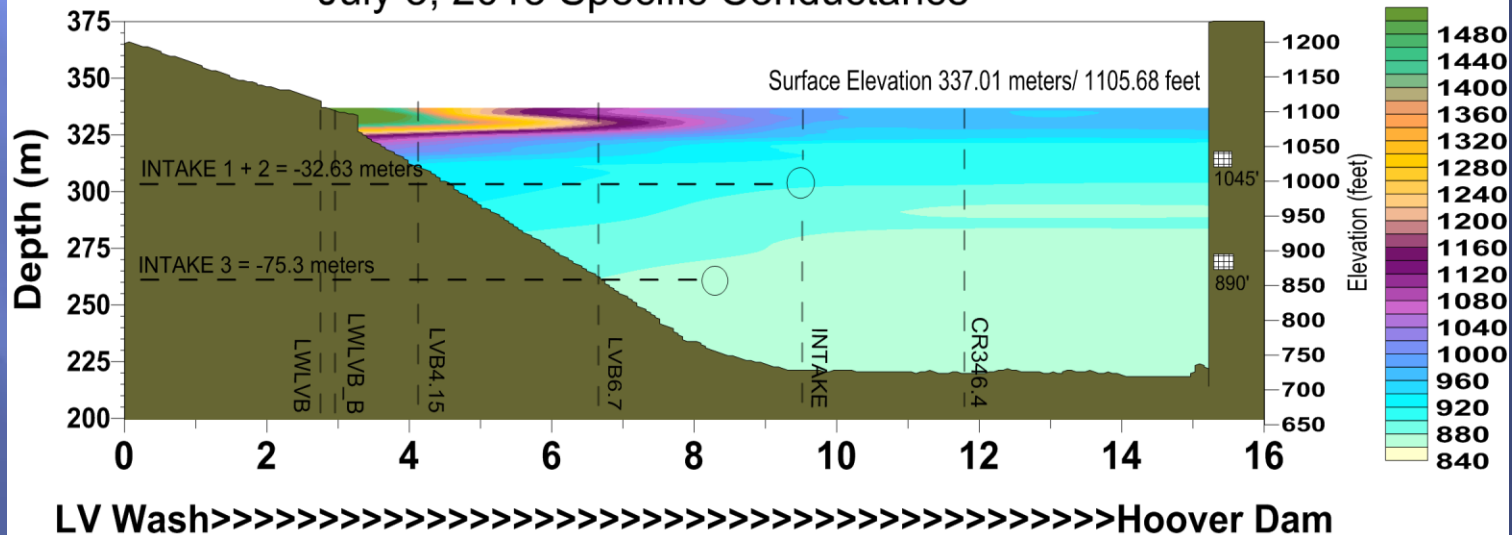
- ▣ SNWA began sampling Lake Mead during the HFE's with the November 2012 Release.
- ▣ Added Nutrient sampling with November 2013 release.
- ▣ HFE entered Lake Mead as an underflow during both 2012, 2013 releases in November.
- ▣ 1996 and 2008 releases took place in March. Spring release may change how HFE impacts water quality in Lake Mead.

# Underflow v/s Overflow

February 7, 2012 Specific Conductance



### July 3, 2013 Specific Conductance





# THANK YOU

- ▣ National Park Service and U.S. Geological Survey for providing boats and staff.



QUESTIONS???